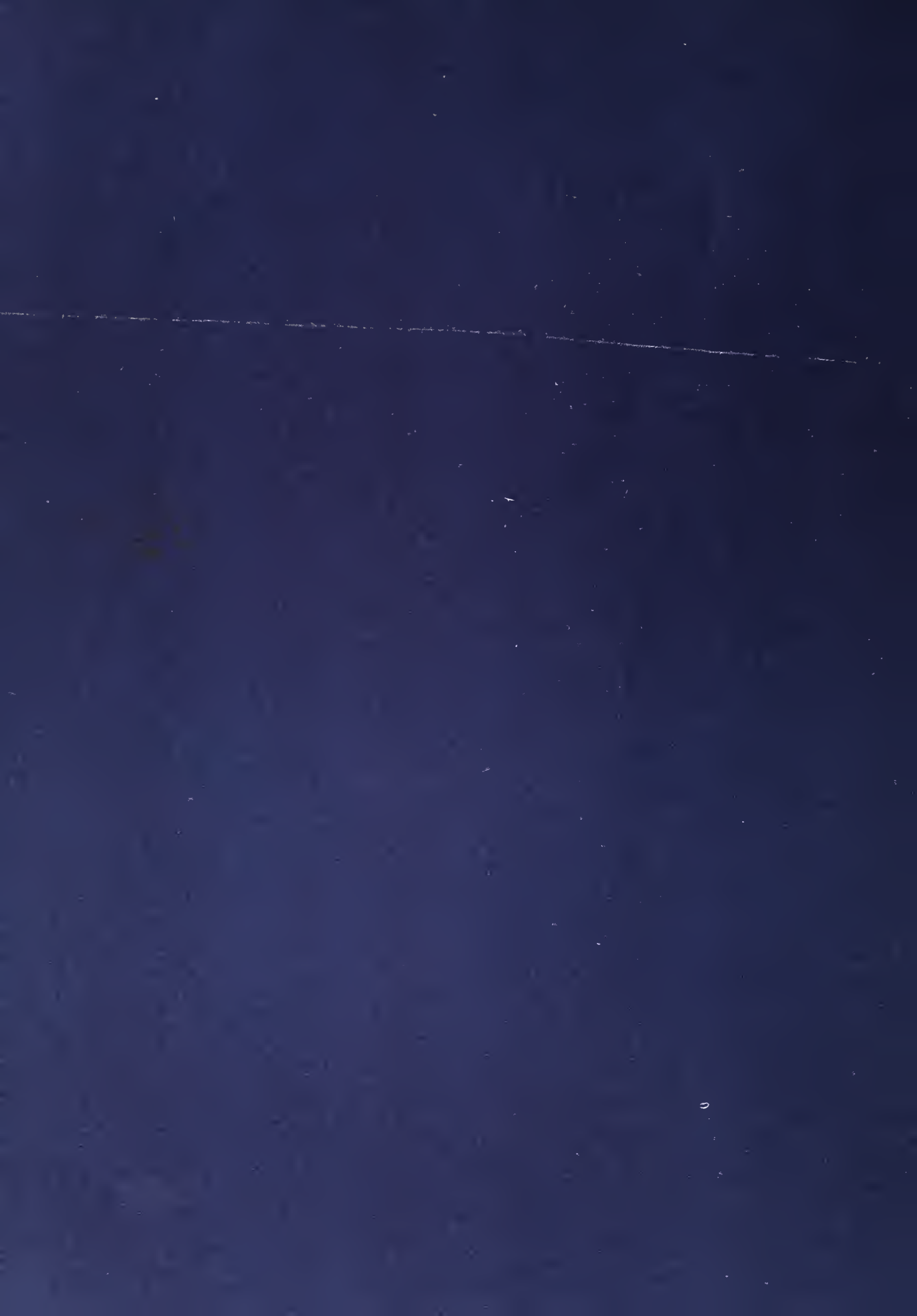

FDD Field Report 38

TRANSPORTATION AND VIETNAM'S AGRICULTURE

International Development Center
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ABSTRACT

Vietnam's water, rail, and road transportation industry has enough moving stock to transport an estimated 70 million M.T. of freight annually. The country's postwar agricultural freight transport requirements are estimated at 6.5 million M.T. Thus, the industry appears capable of handling the postwar agricultural transport task. However, repair of railroad and highway roadbeds, some dredging of waterways, and security of routes will be necessary to attain the moving stock capability.

Construction of farm-to-market roads in new agricultural areas and improvement in basic water and land routes and in transport moving stock could substantially lower costs and increase efficiency of transport. Consequently, it would encourage the country's economic development. Recommendations for transportation improvements are given.

Keywords: Vietnam, agricultural products, transportation, economic evaluation, freight rates, capacity, requirements, foreign aid.

NOTE

Throughout this publication, weights are given in metric tons (M.T.).

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Clarence A. Moore

SUMMARY AND RECOMMENDATIONS

Summary

The shape, topography, climate, natural vegetation, and other geographic features of South Vietnam are such that engineering and economic difficulties in transportation development probably will be greater than in most countries. Costs of transportation facilities and operations, consequently, will likely be somewhat higher than norms used in development planning in other countries.

The Delta is the country's farming breadbasket and contains 65 percent of the total population. The Coastal Lowlands has a farm and fish economy and 30 percent of the population. The Highlands has little farming and only 5 percent of the population. This is the general setting for transport needs in the country.

Only land and water transport were included in this study since the economic feasibility of air transport would support only a small volume of specialty products in peacetime. The Delta is served by both waterway and highway transport. The Coastal Lowlands is served by highway, railway, and coastal ports. The Highlands is served only by highway.

In the immediate (5-10 years) postwar economy, assuming a complete cessation of hostilities, the country will need transportation to move an estimated 6.5 million M.T. of agricultural produce annually. About one-fourth to one-third of the movement would be rice, slightly more than one-third a rather wide variety of fruits and vegetables (including bananas, pineapples, sweet potatoes, and manioc), and about 10 percent livestock, livestock products, and fish.

The volume of transport will increase, but movement patterns will likely not change rapidly. Rice moves from the Delta to Saigon, from Saigon north to nearby Highland provinces and to coastal cities, and from coastal ports inland. There may be more movement that will bypass Saigon as development occurs. Livestock, poultry, and eggs move to collection points within the Delta, from the Delta and nearby provinces into Saigon, and from Saigon into deficit provinces mainly to the north. Fruits and vegetables move from the Delta surplus producing areas and the Highland province of Tuyen Duc (around Dalat) to Saigon, from Saigon to various deficit provinces both north and south, and from Dalat to central coastal cities and north to Da Nang and Hue. Fringe movements outside these major channels for vegetables and livestock will likely increase in importance. Too, the patterns may alter somewhat with a shift from live to dressed meat for poultry and livestock and with increased production of vegetables in new areas.

An assessment of capacity in the major transport systems indicates sufficient moving stock or conveyances to meet postwar requirements for agricultural transportation. The present moving stock is estimated to be capable of moving about 70 million M.T. of freight annually. Two million M.T.

of total capability is by railway, over 9 million M.T. by inland waterway, 1.5 million M.T. by coastal waterway, and 57 million M.T. by highway. Poor, damaged, or destroyed roadways, obstructions in waterways, and official and wartime delays of one type or another have rendered impossible the attainment of moving stock capacity in transportation.

Repair of wartime damage on present roads and railroads as well as dredging of waterways is necessary to make them operable in some areas. This is particularly the case with the railway system (if service is to be restored over its entire length) and with waterway dredging, which has been badly neglected in the Delta. When restored, these basic transport means reach all regions and sectors of the Vietnamese economy where interprovincial movement of agricultural products occurs. Major roads even link the larger villages and cities in the Highlands (around which future farm production is considered a development potential) to cities and markets throughout the country.

Consequently, additional basic transport needs are likely to be farm-to-market roads in potential areas of new farming, particularly in the Highland provinces of Darlac, Pleiku, Quang Duc, and Lam Dong, and possibly in some of the valleys that stretch westward into the foothills from present farming land in the Coastal Lowlands. These collection roads would be needed to get produce from the farm to a shipping point on the existing roads.

Even though existing modes and facilities are physically capable of fulfilling the immediate postwar transportation requirements, their kind, condition, and operation procedures fall far short of long-term economic efficiency. Over and above repairs of wartime damage, roadbeds (and possibly railbeds) need improvement to withstand the freight load punishment they will get. Rivers and canals need improvement (dredging and clearing) to shorten transport routes and enable them to accommodate larger watercraft. Conditions of operation such as load regulation and enforcement, checkpoint costs and delays, and receiving and loading out efficiencies need to be improved. These are only a few of many actions that have the potential of lowering both public and private costs in the transportation industry, thereby adding encouragement to market development.

The average cost for transporting farm products in a 10 M.T. truck in 1972 was estimated at VN$58.4 per kilometer, or VN$11.7 per M.T. kilometer, assuming a 50 percent load factor. 1/ This compares with the GVN official cost rate on a 3 M.T. truck of VN$14.7 per M.T. kilometer.

Actual rates charged vary widely. In general, they vary from VN$9 per M.T. kilometer for distances over 400 kilometers to about VN$14 for a distance of 100 kilometers (costs rise rapidly for shorter distances) for such freight as rice, other grains, sugar, flour, and fertilizer. Rates

1/ The Appendix compares the truck size designation to carrying capacity for various commodities.

are twice as high per M.T. kilometer for bulky products (such as jute and peanut meal) and live animals (such as hogs and beef) since tonnage hauled per load is much less. These rates are probably significantly higher than would prevail in peacetime with improvements in operating conditions. Nevertheless, estimates of transport cost as a portion of their Saigon wholesale price varied from 1 to 3 percent for hogs and poultry to 6 percent for rice and slightly more for some vegetables. This is not an unduly large proportion of product value compared with transport costs in the United States.

Recommendations

Insufficient data and information are available to suggest priorities for improving Vietnam's transportation industry. Therefore, except as indicated, no priority is attached to the following list of recommendations. Priorities suggested in the first four or five items apply only to investments in the basic transport means to which they refer. Actually, a regulatory agency or investment alternatives revealed by cost/benefit studies may be of greater benefit and, consequently, of higher priority than the investment items noted.

In this regard, then, I recommend that:

1. Investment priority be given to developing farm-to-market roads in areas where new production has great potential and is to be officially encouraged. Roads linking new farms to the nearest collection and shipping points are probably needed more acutely than improvements and repair of existing facilities in present farm areas. At least produce is being moved from present farm areas; improvements are needed in these areas, but their delay may not be as crucial as the need for access roads in new farming areas. Lack of means to get produce to the market can prevent successful development.

2. Expenditures for dredging, clearing, and securing waterway transport routes in the Delta and connecting the Delta to Saigon receive equal, if not greater, attention than expenditures for highway improvement in that region. The waterways are capable of handling most transport requirements at a relatively low cost. Highway transport increased in the region mainly because of wartime conditions that (1) increased the value of rapid delivery, and (2) caused water travel time to increase relative to truck travel time. The longer time required for waterways was due to insecured water routes, which meant taking longer, round-about routes and traveling by convoy, with its attendant delays.

   The feasibility of highway transport serving the Delta is not denied. With peace established, however, it seems likely that expenditures to improve Delta waterways may reap greater returns (mainly in lower cost transport) than improvements in highways (where, admittedly, substantial gains are possible).

3. Consideration be given to reestablishing, as soon as feasible, railway freight service. Reestablished service could serve as a stop gap measure for handling acute short-term transport needs while planning and building the long-term basic transport structures. This short-term role could lead to recognition that the railroad has long-term economic potential.

   This suggestion rests on the premise that a large portion of railroad transport costs (moving stock, rail lines, way stations, repair shops, etc.) are fixed rather than operational, and that most of the fixed investments already have been made. They are presently available, have no discernible alternative use, cannot be withdrawn, and are, essentially, available for use at no additional cost. Thus, it appears the railway may be a least-cost alternative in a short-term reconstruction program for a peacetime Vietnam.

4. The following ordered priority in expenditures for repairing and improving the national and regional road systems be considered: (1) The Highlands, (2) the Coastal Lowlands, and (3) the Delta. This ordering considers the fact that the Highlands have no alternative transport system other than highway and, given the Delta waterway improvement suggested in recommendation 2, the Coastal Lowlands may be the next most promising area for benefits from investments.

5. An effective freight transportation regulatory and enforcing agency be established. There is need for some rate regulation to eliminate rates acting to discourage certain aspects of market competition. In some cases, transport rates discourage the movement of goods that best serve the country's economy. There is need also to establish and enforce regulation of maximum load weights by size of truck and type of roadbed in freight transportation. To obtain maximum benefits from road constructions, the freight limits for which they were designed will have to be enforced. Truck operators and drivers unwittingly are prone to increase their costs by overloading. This causes breakdowns, undue wear on vehicles, and rapid truck depreciation, and greatly increases highway hazards. Enforcement of such regulations should save the highway, increase the transporter's longer term net returns, and save lives and avoid human injuries that occur from unregulated driving and transport conditions.

6. Consideration be given to establishing an agricultural market information system. The dissemination of better pricing information, establishment of a better pricing procedure, and, ultimately, encouragement of advance pricing on deliveries could do much to improve marketing and transportation. Competition between truck and waterway transport from Delta points to Saigon probably has been more influenced by product price

than by transport services and costs. A large part of the higher transport rate paid for truck over watercraft transport of relatively nonperishable products such as rice and other grains (and even for live animals) has been a cost for avoiding the hazard of a product price decline before delivery in Saigon. Competition between transport modes from the shippers' side needs to be focused altogether on rates related to transport services. Speed is a transport service that should be paid for. Price hazard is something the market system should reckon with, instead of being charged to transport costs.

7. Potential cost-benefits of refrigerated transport and marketing of perishable agricultural produce be evaluated. As much as VN$2-3 billion may be lost annually from lack of refrigeration in current marketing of fruits and vegetables alone. Greater marketings, including possible exports, will occur with peacetime development, resulting in greater losses unless refrigeration is possible throughout the marketing chain. In addition, changing practices in commercial slaughter of livestock and poultry and movement of dressed meat, poultry, and fish (rather than live) will likely enhance the benefits of refrigeration.

   Refrigeration in transport alone is not likely to adequately alleviate the problem. This plus refrigerated storage at broker and wholesale levels and refrigerated display at retail level should be evaluated as a package in a cost-benefit analysis.

8. Potential savings from proper crating, packaging, and packing fruits, vegetables, and other farm produce for transportation be evaluated. A good portion of total Vietnamese economic activity is directed to supplying food for the people. Avoiding loss and weight in marketing and retailing could result in great potential benefits.

9. The overall movement of goods in the transportation systems be studied and evaluated, as well as how agricultural products fit into this movement. A continuing program of collecting, arranging, and publishing basic data and statistics on agricultural freight, traffic volumes, freight composition, direction of movement, rates, and costs should be initiated. Present data and information are acutely inadequate as background for the intense planning and policy decisions that will be in process the next few months and years.

10. Decisions concerning investments in highways give consideration to more improvements rather than repair or patch-up. Cost-benefit evaluations need to be made to indicate where greater gains from expenditures can be realized. No doubt other factors influence political decisions; however,

politicians and governmental personnel prefer to make their decisions with a background of economic knowledge rather than without it.

One question that needs study is whether the long-term benefits from greater durability of roadbeds will compensate for higher initial cost. Less costly highways (thus, less durable) incur expensive upkeep. Cost-benefit evaluations should consider the usual factors such as initial construction costs, the traffic (particularly freight traffic) the road will have both in the near and more-distant (10 years?) future, and upkeep costs compared with less durable alternative roadbeds.

They should include, as well, consideration of relative road hazards, safety, travel time, and, most important, the savings to users in terms of less depreciation, lower repair and upkeep, and lower vehicle operating costs. This last involves information that, when developed, could be useful background for public policy decisions concerning the means of raising funds to finance road improvements. An estimate of the economic benefit from faster freight transport on less hazardous roads could be useful in similar fashion.

11. Non-transport fees and charges be eliminated. This includes provincial export or boundary fees, illegal checkpoint payments, and other fees that increase transportation costs without contributing to providing the transport service. They unduly burden the movement of products; add to the final cost of products, thus limiting the volume sold; and decrease the price paid farmers, thus giving him less encouragement to produce. Finally, such fees and charges hinder economic development. No doubt, there is need for a source of public revenue at the province level and some consideration should be given to the potential sources for such revenue. To unduly burden transportation of farm products to outside markets for such general revenue may be self-defeating.

12. Checkpoint, shipping, receiving, and other delays in transportation that are subject to public policy be eliminated with the return to peace. Transport vehicles and personnel are forced to idle while being paid for transport time at checkpoints entering Saigon and other cities, as well as at province boundaries. Convoy systems force all vehicles to move at the pace of the slowest vehicle; they also cause delays in formation. It is said that some motorized inland watercraft averaged only 1-1/2 round trips per month from Delta points to Saigon under convoy, compared to 6-1/2 round trips per month previously. The removal of all such transport delays and barriers with peace should significantly lower the cost and rates in transportation.

13. A Transportation Information and Education Service be established. This complements the fifth recommendation. GVN should consider initiating a continuing study and evaluation of alternative practices and performances that affect efficiency and economy in transportation. Appropriate educational and information materials could be placed in the hands of those in position to profit by the knowledge.

    For example, a booklet describing the consequences of truck overloading in terms of its effect on costs and, ultimately, profits may influence truck owners and operators. Possibly, such information would lessen the workload of regulatory agencies.

14. The interrelation of transportation with marketing in general be emphasized. The effect on transport efficiency and costs of adequate and strategically located storage and warehousing facilities, adequate receiving and loading out facilities at these warehouses, an efficient grading and standards system, an efficient pricing institution, and a host of other market activities and institutions have been verified in U.S. and other country studies. These facets need to be considered in plans concerning the transportation system.

TRANSPORTATION AND VIETNAM'S AGRICULTURE

by Clarence A. Moore

INTRODUCTION

By necessity, wartime data and information are used in this study to evaluate South Vietnam's peacetime potential for transporting agricultural materials. The hazards in this are recognized and an effort is made to keep implications of such data explicit and in proper perspective to the results.

The study is cursory. It fills in some information gaps, specifies some additional research needs, and suggests some broad reconstruction and development transportation policies worthy of consideration by planners of South Vietnam's economy.

Air travel and transport service is presently provided to all regions. It is not included in this study because it likely will decline as peace is established and its competitive rates would eliminate its use for all but small amounts of specialty agricultural products.

All important facets of land and water transport are included. Their hazards, problems, and potentials are considered. Transport costs are specified as reliably as possible. The use of the data for planning purposes is illustrated when it appears to be needed.

General features and attributes of the country, its people, and the economy are important components of the transportation problem. They are indicated, but not fully specified, in the brief discussion that follows.

South Vietnam's shape--like a long, narrow quarter-moon (figure 1)--defies economy and flexibility in transport. One-way capacity loads with expensive empty or partial returns likely will characterize whatever system exists, especially in early development.

The country's natural topography adds to transport difficulties. The canals, rivers, and streams that crisscross the Mekong Delta favor water transport, but they are formidable barriers to construction of land transport routes. The Mekong River, shallow in some parts and subject to heavy silting in others, has a potential periodic dredging and clearing cost for transport of larger volume cargo. Rugged mountains, forests, and rough terrain make substantial roadways costly and isolation a persistent problem in the Central Highlands, where 5 percent of Vietnam's population is thinly dispersed in small villages and settlements. The Central Lowlands Region is a long, narrow strip of coast pressed between rugged mountains and the sea. Its transport is plagued by shifting sand dunes, torrential rain hazards, and coastal port problems. Other countries have similar physical problems in transport, but Vietnam has, in combination, a greater proportion than most.

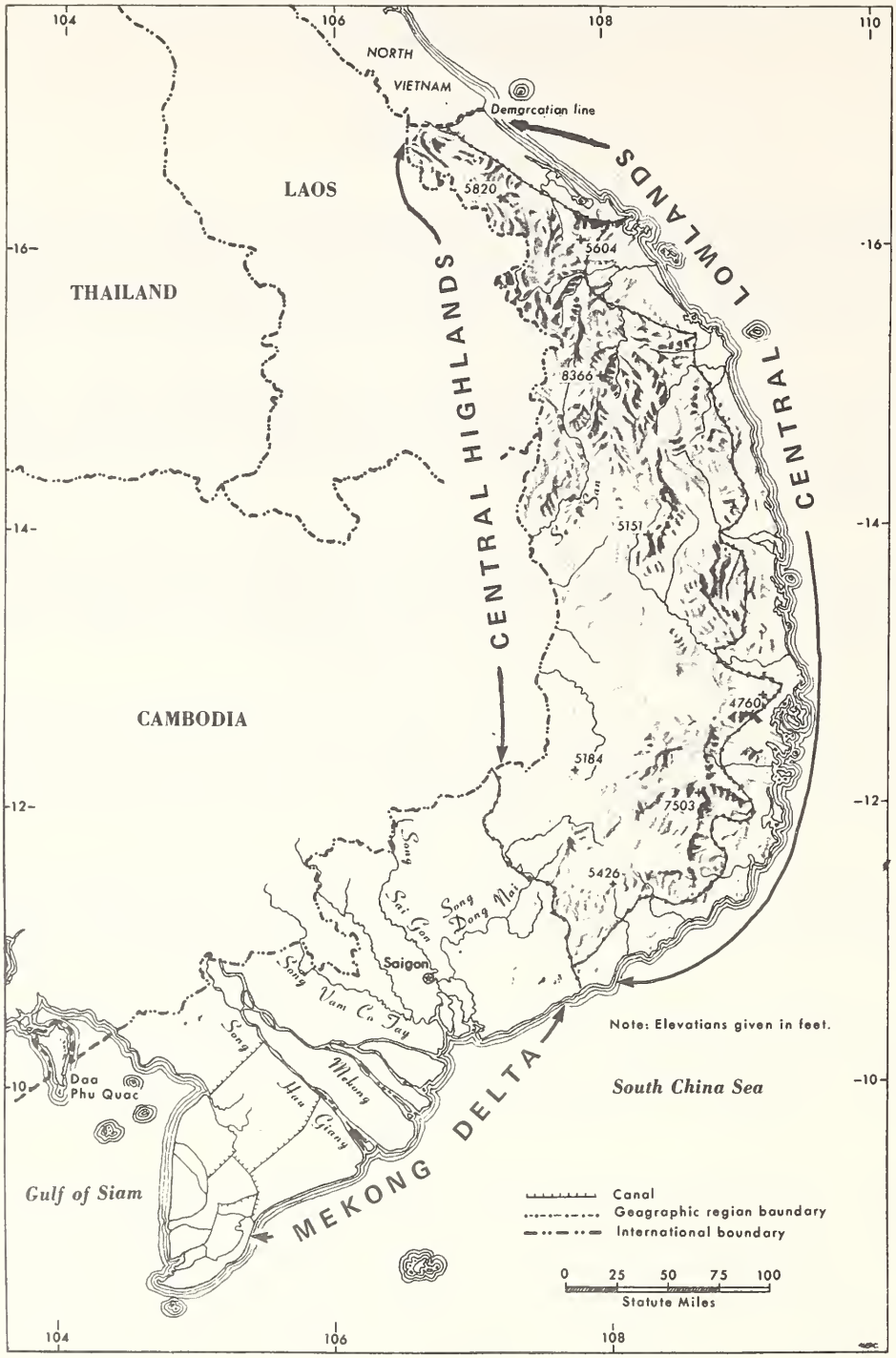

Figure 1.--Geographic regions of Vietnam, showing rivers, canals, and elevations of principal mountains. Map courtesy Foreign Area Studies, The American University (see Bibliography reference 17).

Location, concentration, incomes, technical capabilities, customs, consumption habits, and government are aspects of the Vietnam population that affect the need and potential for agricultural transport. Roughly 65 percent of 19 million people live in the Southern Region, 30 percent in the Central Lowlands, and 5 percent in the Central Highlands (table 1). Concentration ratios (that vary widely by province within a region) average 150 persons per square kilometer in the Southern Region, 140 in the Central Lowlands, and only 19 in the Central Highlands. About 14 percent of the population resides in Saigon-Cholon.

Incomes, in general, are relatively low. Improvements in the economy will lead to substantial market growth and increasing transportation requirements. 2/ The more isolated portions of the population, particularly those in areas with large agricultural potentials, probably need some means of transport to market points to initiate development and involvement in the market sector. The contribution of all sectors to an expanding national economy will depend considerably on how well and wisely transport means are provided to support the growth of the market sector. Efficient transport, in turn, depends on a sizable pool of Vietnamese technical, professional, and managerial capabilities. The present pool is being enlarged by training, both within the country and abroad. The Vietnamese people in general are remarkably industrious and display abundant initiative. What is needed is a proper environment to motivate this industry and direct this initiative in the right direction for development.

The economic growth pattern is affected by the ease with which customs and traditional ways are replaced by efficient methods and the facility with which consumption habits change to absorb the products and services of the market. Bagging rice and hauling it long distances to market in a

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2/ The stress and strain of economic growth is focused on the market sector. Economic development is, above all, a process of transformation from subsistence and barter to a market economy. Continued economic growth will depend on emergence of more sophisticated and complex marketing systems. Consequently, markets are, in a real sense, the crucial sector in economic development.

The dilemma of directed development lies in the fact that growth in production is stimulated by having proper market facilities available to handle the increasing quantities, while growth in market facilities is stimulated by having more production than can be properly cared for with existing facilities. Each is a determinant of the other.

The development strategy is to get a balance in the growth of both so producers will feel greater production is needed to supply the market and market operators will feel more facilities and services are needed to care for the production.

Just as growth in the general economy depends on market development, growth in markets depends on transportation development.

Table 1.--Vietnam's population and land area by regions 1/

Region	Population		Land area		Persons per km.^{2}
	Thousands	Percent	Km.^{2}	Percent	
Southern	12,223	65	79,292	46.1	154.2
Central Highlands	989	5	51,944	30.2	19.0
Central Lowlands	5,687	30	40,764	23.7	139.5
Total	18,899	100	172,000	100.0	---

1/ Vietnam Statistical Yearbook. Population estimate is a projection.

non-motorized sampan will likely give way to bulk handling and large volume transport. Live poultry and livestock in consumer markets will give way to dressed poultry and consumer beef cuts which are handled, transported, and retailed under refrigeration, at controlled temperatures. Such changes do not occur overnight.

Most important are government decisions regarding general economic growth, and the role of transportation in that growth. If public officials favor one transport mode over another, if they do not adequately appreciate transportation's role in inducing development, or if they have insufficient research information to guide their decisions, their policy and programs will suffer accordingly. Decisions by government officials will swing the pendulum that marks time in South Vietnam's development.

AGRICULTURE'S TRANSPORT REQUIREMENTS

A large proportion of the Vietnamese people depend on agriculture for their living. 3/ The war disrupted normal patterns of livelihood, so peacetime conditions may well see an initial increase in the proportion of the population engaged in rural enterprise. In near-normal times agricultural products (mainly rubber and rice) account for over 90 percent of the country's total exports. Most rural labor is self-employed on small, family-operated units. Self-sufficiency is a first priority on most farms. The market generally gets what is produced above family food requirements.

These characteristics generally are associated with backward, undeveloped means of transport. Military operations in Vietnam, along with U.S. and other economic support, have induced considerable improvement, enlargement, repair, and maintenance of transportation facilities. This has been a

3/ The Government of Vietnam indicates that 80 percent of the population were farmers and fishermen in 1960; this had dropped to 60 percent by 1969.

difficult and costly undertaking with Viet Cong destruction. There still are backward practices in transporting goods, particularly in the civilian sector. However, the nation has more transport facilities than it likely would have had without the conflict to spur their development.

The transportation problem in agriculture, in its simplest terms, is to move products from surplus to deficit areas within the country or to export points, and to move agricultural requisites such as fertilizers, insecticides, farm equipment, and supplies from their production or import receiving points to areas where they are used. It is not, however, a simple problem.

This section describes general features of Vietnam's agriculture, location of production, and direction of movement of major products. All of these affect transportation. Quantitative estimates of the potential post-war movement of agricultural products are presented to indicate transport service needs.

The Plantation Sector

In Vietnam there are two markedly different and separate farm sectors--a plantation sector and a family farm sector. The plantation sector is made up of fewer than 5,000 farms which produce industrial crops such as rubber, tea, and coffee (see Bibliography reference 5). These are large farms located in the Southern Region north of Saigon and in the Central Highlands. The bulk of their production is transported to Saigon and coastal ports for export.

Rubber dominates the plantation economy. More than 85 percent of the total production was exported in earlier years, but only about 70 percent was exported in 1969 and 1970. This was due to production declines caused by war damage and increases in domestic consumption. Exports amounted to 24,000 M.T. in 1970, about one-third their volume before war ravaged parts of the production areas. Shipments vary somewhat from month to month, but there are no marked seasonal highs or lows to contend with in transport.

Tea is a minor crop. Annual production has held steady between 4,000 and 6,000 M.T. during the last 2 decades. Exports were less than 200 M.T. in 1969 and 1970, a decline from over 2,000 M.T. annually in the mid-1960's. Tea is consumed throughout the country, so most tea is transported from the localized production area for distribution through the market system.

Some 7,000 to 8,000 M.T. of tobacco are produced annually. Half as much is imported and added to the production to meet domestic requirements.

The Family Farm Sector

The major agricultural sector comprises about 2 million small farms averaging less than 2 hectares in size. These mainly grow rice but also have some poultry, a hog or two, and small plots of a wide variety of other crops (see Bibliography reference 5). Rice has been, is, and will remain for some

time in the future the chief food of the Vietnamese people. Roughly 85 percent of the country's total crop acreage is used to produce rice (see Bibliography reference 19). Over 90 percent of the Delta acreage is in rice.

Rice Production and Movement.--Some rice is grown in all parts of the country. Those provinces that produce a surplus above their own needs comprise the so-called western part of the Southern Region (table 2). This is the Mekong Delta proper, the breadbasket of Vietnam. Provinces in the eastern part of the Southern Region, north of Saigon, produce less than they consume and are deficit areas. Most provinces in the Central Lowlands and in the Central Highlands are also deficit areas and must bring rice in to meet their food requirements. This explains, in part, the historical pattern of moving rice from the Delta through Saigon on to deficit northern provinces. There have been some recent efforts to encourage direct shipments.

Rice moves from small-plot farms in small quantities to local collection points. There, it is loaded on large trucks, barges, or junks for transport to Saigon or to deficit markets. Plans are to increase rice production sufficiently to care for demand from the increasing population and, hopefully, to regain export markets lost during the 1960's. Regardless, the pattern of movement will likely change very slowly from that indicated, i.e., out of the Delta, to Saigon, and on to the northern provinces. Shipments that bypass Saigon and go directly to northern provinces may increase (see Bibliography reference 9).

Exports, if any, will probably leave Saigon or Can Tho and Vinh Long ports. Vung Tau could become a transshipment point if its port is developed. Cam Ranh is considered by some as the best harbor in Vietnam, but its location relative to surplus production areas leaves it unlikely to serve the rice export trade.

Shipments from the Delta into Saigon are heavier from November through March than from April through October. Peak season shipments may reach twice the volume of slack season shipments. As TN rice production increases (including double cropping) it likely will tend to level the peak movements (see Bibliography reference 9). More will enter commercial channels requiring transportation and marketing facilities.

Poultry and Swine.--Poultry and swine are next to rice in importance as farm enterprises in Vietnam. In general, production intensity is closely related to population density (see Bibliography references 3 and 8). The Southern Region produces about 70 percent of the country's poultry, eggs, and swine, the Central Lowlands about 25 percent, and the Central Highlands about 5 percent.

Most production is on farms with small, back-yard flocks of poultry and a few swine. Larger, commercial-sized operations of both poultry and swine tend to concentrate near Saigon and other large urban centers (see Bibliography references 3 and 8).

Table 2.--Vietnam's population, milled rice production, estimated consumption, and surplus or deficit areas, by regions, 1971

Region	Population 1971	Milled rice production 1/	Rice consumption		Surplus or deficit 3/
			Per capita 2/	Total	
	1,000	M.T.	Kg.	M.T.	
Southern Region: total	12,238	2,405,750	154.5	1,890,901	+ 514,849
1. Western part	6,940	2,193,500	168.6	1,170,302	+ 1,023,198
2. Eastern part	5,298	212,250	136.1	720,599	- 508,349
Central Lowlands	5,686	422,500	142.6	810,685	- 388,185
Central Highlands	988	29,500	151.5	149,722	- 120,222
Total	18,912	2,857,750	150.8	2,851,308	+ 6,442

1/ Assumed to be 50 percent of paddy.

2/ Estimates based roughly on the rice consumption study.

3/ The surplus may be overstated. Recent estimates of average per capita consumption are about 155 kg. compared with 150.8 used above. Also, the assumption that milled rice for consumption is 50 percent of production may be high. R. J. Foote (Bibliography reference 6, table 2) indicates that, in recent years, about 78 percent of available rice was milled. A 60 or 62.5 conversion ratio in milling applied to 78 percent of available paddy = 47 to 49 percent.

There is considerable transportation of swine, poultry, and eggs within the country. Most movement occurs (1) from small farms in the Delta to collection and slaughter points at such places as Can Tho, Sa Dec, My Tho, and Long Xuyen, (2) from those points and nearby provinces into Saigon, and (3) from Saigon into deficit provinces. But there is also some movement in other parts of the country; poultry and eggs are shipped from Dalat to Saigon, for example, and hogs are shipped from coastal areas into the Highlands. Such movement is expected to increase with development.

Both poultry and swine are transported live. This means a good deal of waste material is involved in transport weight. Only those swine consumed in local markets are slaughtered at collection points.

Egg production, particularly duck eggs, is related to the rice harvest. Movement from the Delta is at its peak from October to February, declines sharply March to June, and is insignificant July through September (see Bibliography reference 3). Livestock arrivals in Saigon are somewhat higher from April through September than from October through March, but the movement is fairly well distributed throughout the year.

Fruits and Vegetables 4/--Fruit and vegetable production, overall, is widespread in Vietnam, but tends to be concentrated by kind. Sweet potato and manioc, although widespread, are grown in larger quantities in the northern provinces of the Central Lowlands. About one-third of all other vegetables are grown around Dalat. Considerable quantities are also grown around Da Nang and Hue and in parts of the Southern Region south of Saigon.

Over half the production of pineapple is in Kien Giang Province on the southwestern coast and one-fourth is in Long An Province immediately south of Saigon. Banana and other fruit production tends to be concentrated in those provinces along the Mekong River, with roughly 35 percent of total fruit production (excluding banana and pineapple) grown in Dinh Tuong Province.

Vegetable production increased in the 1960's. Interestingly, sweet potato and manioc showed recent declines while fairly large increases were registered for such vegetables as cabbage, carrots, cauliflower, leafy vegetables, radishes, and onions. The trend seems to be toward increasing consumption of green and yellow vegetables by the Vietnamese people.

About 95 percent of the vegetables grown around Dalat are shipped to other parts of Vietnam. Roughly three-fourths of the shipments move to Saigon and one-fourth go to the central coastal ports and north to Da Nang and Hue.

Probably more than 200 thousand M.T. of vegetables move out of Dalat annually by truck. From the transportation viewpoint, this amount would

4/ This section relies heavily on Pearson (see Bibliography reference 13).

require a daily average of 70-75 trucks with 8-M.T. loads leaving Dalat 365 days of the year. 5/ However, requirements for vegetable transport have seasonal highs and lows, so a larger fleet is often required.

Losses of vegetables have been estimated as high as 25 to 40 percent, with most attributed to transportation. There are so many contributing factors it is difficult to specify where deterioration begins and its cause. Some of the in-transit causes are (1) improper packaging (no packaging) for transport, (2) improper loading, (3) lack of refrigeration, (4) excessive and rough handling, and (5) excessive delays in transport. There seems little doubt that measures to avoid the loss would be economically feasible.

If sweet potatoes and manioc are eliminated from the 650-700 thousand M.T. of vegetables produced annually, and only half the 220-235 thousand M.T. of other vegetables are assumed to be significantly benefited by refrigeration, there would be a saving of VN$1.65 billion annually, assuming only 20 percent foregone loss attributed to lack of refrigeration. This would support an VN$8 billion investment in refrigerated trucks and storage units for vegetables alone. This probably is a conservative estimate. Potential savings for fruit are likely as great. Too, quality loss for some fruits and vegetables due to lack of refrigerated facilities is fully as important as total loss.

Both fruits and vegetables are grown in excess of local needs in various parts of the Delta. They move from such points as Rach Gia, My Tho, and Can Tho to Saigon both by waterway and truck.

Estimated Postwar Transport Requirements

Data indicate there is considerable need for transportation of agricultural products. Requirements will likely increase in the postwar period. Too, requirements run the gamut from seasonal to non-seasonal, from perishable to non-perishable, from short distance to long distance, from small lots to large lots, and from low-value to high-value transport.

Table 3 contains estimates of Vietnam's postwar agricultural transportation requirements, assuming a complete cessation of hostilities. Although based on plans for developing agricultural production, arbitrary judgments were made on such matters as the proportion of total production that would move into market channels and whether near or distant transport would be needed. The data do not include transport involved in local assembly.

The data suggest that Vietnam should be prepared to move internally about 6.5 to 7 million M.T. of agricultural products. Produce would be moved varying distances, of course. If total movement averaged 300 kilometers per haul, a 2-billion M.T. kilometer movement would be necessary to support the marketing of Vietnam's agricultural produce.

5/ The Appendix compares truck size designations with capacity to carry various commodities.

Roughly a third of the transportation requirement will be for rice, another third for all fruits and vegetables, and slightly more than one-tenth for livestock, poultry, and livestock and poultry products.

This study mainly concerns the basic transport modes, structures, and facilities, particularly the condition and capacity of the moving stock. The figures below were derived as a guide to the postwar needs of the agricultural industry so that the ability of the transport industry to meet those needs could be evaluated.

Table 3.--Vietnam's estimated internal postwar transportation requirements

Commodity	Amount to be moved internally 1/
	1,000 M.T.
Rice	2,000
Sorghum and corn	100
Peanuts, soybeans, etc.	75
Industrial products	100
Sugar	250
Sweet potatoes	250
Manioc	250
Vegetables	850
Fruits	500
Bananas	500
Pineapple	75
Watermelon	50
Miscellaneous agricultural crops	50
Hogs	100
Other livestock and livestock products	50
Poultry	25
Eggs and other poultry products	25
Fish	500
Forestry products	400
Fertilizer	500
Total	6,650

1/ These estimates are based primarily on production estimates for 1975 in the GVN's 5-year development plan and the ERS economic sector analysis. Production areas (concentrated or widespread), per capita consumption, movement patterns, etc., were considered in deriving the, admittedly, rough estimates. For example, it is estimated that only 1 million M.T. of rice will leave the area where produced, but an average of two trips will be involved in getting it to its various consumption points.

Consequently, two points should be made in conclusion. First, efficient and economical transport depends on such attendant services as departure and receiving point warehouses or storage units, receiving and loading-out facilities, and refrigeration, packaging, and other means of maintaining product quality in transit which are not a part of this report. Second, the data in table 3 is a postwar estimate centered around 1975. A rapid increase in population is expected and, if development plans are realized, a rapid growth in agricultural production will occur. Generally, market facilities, including transportation, must increase 2-3 times the rate of growth in the general economy if the development push is to proceed unencumbered. Thus, projections to 1985 could well double the agricultural transport needs of South Vietnam.

THE TRANSPORTATION SYSTEM AND ITS CAPACITY

This section evaluates the capability of Vietnam's transportation system to handle postwar requirements. Recent data and information are used with recognition that these are not the most satisfactory basis for peacetime plans and decisions. The country has been at war for 3 decades. Existing transportation conditions such as investment, overhead stock, operation practices, transport use of different systems, cost structures, and public policy were determined and conditioned by war, not peace. An effort is made to explicitly recognize the more obvious pitfalls in projections from a wartime base to a peacetime economy.

The war in Vietnam probably was responsible for a number of transportation facilities, particularly in the highway system, which would not otherwise exist. The war has been destructive. Much Viet Cong effort has been expended to: destroy transport routes by dynamiting bridges, roadways, rails, dredges, and other facilities; create insecurity in transport routes by sniper attacks on boats and trucks; and exert economic pressure by setting up checkpoint and fee collection stations along the main roads and inland waterways. Repair and maintenance of transport routes and facilities have been expensive and hazardous. Periods of service for the replaced lines, roads, and moving stock have been unpredictable.

In looking to the future, particularly the immediate postwar period, the existing transport structure is the starting point. Whether past investments were wise or unwise is irrelevant; the investments have been made. If the facilities exist, they cannot be recalled or conveniently shifted to alternative uses. Consequently, existing facilities and stock have zero, or near zero, costs in future plans. The only relevant cost is their repair or improvement and future operation.

The Railroad System

The railway system was built to link together the coastal chain of urban centers east and north with Saigon-Cholon, Vietnam's major industrial and commercial center. It stretched some 1,114 kilometers from Saigon-Cholon

north to Dong Ha just below the 17th parallel (figure 2). Spurs connected the coastal ports of Phan Thiet, Ba Ngai and Qui Nhon with the mainline. In addition, the interior trading centers of Loc Ninh, Bien Hoa, Dalat and An Hoa were connected to the mainline. Altogether, the system comprised some 1,386 kilometers of line. It did not extend west or south of Saigon into the Delta Region.

The railway track is mostly 1-meter gauge, constructed of rail weighing 27-30 kilograms per meter, laid on steel ties. There are over 400 bridges and 27 tunnels in its entire course. These have been major targets of the Viet Cong. During the latter half of the 1960's, less than half the total railway line was operated annually. In early 1972, some 60 percent of the railway line was considered operational, although much less than that was being operated.

A 1958 study of Vietnam's industrial potential stated that the "... railroad...is and will...continue to be the chief means of transportation." The 1966 study by Transportation Consultants, Inc. (TC) (see Bibliography reference 15) asserted that "...the Vietnam railway system is a basically sound property with a capacity for heavy hauling that can be quickly made available." The TC study acknowledged that the increasing role of highway transportation probably was economically feasible but suggested the railway should be immediately repaired with the cessation of hostilities so its use could relieve traffic pressure on the highways while they were being repaired and improved to withstand more rugged use.

However, the 1970 transportation study by Louis Berger, Inc. (LB) (see Bibliography reference 1) recommended that no postwar investment support be given the railway on the basis it (1) was too costly compared with highway and water transport, and (2) did not have the necessary traffic demand to support an economic operation.

These widely different viewpoints of the past are argued among transportation people today in Vietnam. It is not possible in this study to reconcile the different views concerning the future of the railway system. Research data are lacking or insufficient.

However, there are some fallacies that need correction. The premise that the railway system should be discarded because it is a higher cost means of transport than waterway and highway has two weaknesses. First, it implicitly assumes demand does not differentiate in preference between modes, i.e., that it is for transport of a homogeneous, durable product by like-minded (and motivated) shippers wherein time involved, type of service, and distance are of no consequence. In another sense, it assumes the type of transport service is the same by all modes. This is not the case. Cost is only one factor; demand is equally important. Products vary widely in composition, by intransit durability, in distance shipped, and in weight and ease of handling by one mode or another. Shippers have their preferences, too, and not all of these are tied solely to cost. Some are determined by the type and condition of the transport service. The composition of demand for transport service varies widely. No doubt, there is some presently

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Figure 2.--Land transportation routes and principal cities of Vietnam, 1971. Map courtesy Department of State.

undetermined portion of the transport demand in Vietnam that correlates with the unique service provided by railroad. The size of that demand is the relevant question, not whether it exists.

The second weakness concerns cost comparisons of the different modes and conclusions drawn from them. Primarily, it lies in the long-term investment or overhead costs (rather than operation costs) and in that part of overhead supported with public funds. On the one hand is the argument that public-supported investment and operation of the railroad has given it unfair advantage over highway transport (presumably not subsidized). On the other is the argument that highway transport has increased at the expense of waterway because truck operators do not pay their full share of costs, being subsidized by public construction and maintenance of highways. In each case, there is an implicit assumption only one system is subsidized. In reality all three systems were originally subsidized in construction and are being subsidized in maintenance.

More research is needed on the initial investment and maintenance costs of the transportation systems, particularly for road and railroad. This information is not needed to reconcile the economic feasibility of past constructions. It is needed for use when questions about future investments arise, both on costs and means of financing. Again, a system's presently existing facilities have zero cost in planning for future use if there are no alternative uses to which they can be shifted.

The railroad transportation system should not be discarded on the premise that past or present traffic (presumably representing demand) is not sufficient for economic operation. The Vietnam railroad has been operated in piecemeal fashion over short distances of its track during most of the last decade. In contrast, the railroad's competitive strength against highway transport is in longer hauls of heavier freight shipped in greater than truckload quantities. Wartime conditions with war-incurred delays, uncertainties, military shipment priorities, and intermittant, short-distance operation are not a proper base on which to project peacetime railway transport demand.

Potential demand for each of the different kinds of transport services has not been adequately evaluated. The cursory nature of the present study did not provide for such an evaluation. Without both demand and cost evaluations the future long-term potential of the railroad (or other systems for that matter) cannot be economically measured.

Transport services provided by rail, road, and waterway do differ. Vietnam's economy has transport demands that are better provided by each mode. This will be even more the case as peacetime development gets underway. The crucial question then is not whether those demands unique to a particular mode exist (they do) but whether they are large enough that the transport service requirements can be provided at a sufficiently low price to be economically feasible.

Studies indicate about three-fourths of total rail transport cost is long-term investment cost which, with the system in place in Vietnam, represents largely a nonrecoverable cost that varies per unit with volume handled. Only one-fourth is current operation cost that remains the same per unit regardless of volume. Truck transport cost, in contrast, is the opposite with only about one-fourth long-term cost that varies per unit with volume.

Thus, there appears to be considerable merit in the Transportation Consultants suggestion that the railroad be put back into operation in the postwar period to relieve the short-term transportation pressures so that postwar adjustments can be made and long-term construction begun. Only the cost of repair necessary in putting it into operation is relevant in this short-term context. Much investment has already been made in the railroad; this means a large part of the three-fourths of all costs in railroad transport is presently zero for the useful life of those facilities. However, if the railroad is to stay in business over the long-term, amortization of facilities must be considered a cost to provide for their replacement.

The railroad's unique service advantage compared with highway is in hauling heavier materials and larger quantities for longer distances. Rail may also have an advantage over truck transport in partial load deliveries and pickups at various points directly along its route. Its disadvantage is in time involved and in lacking the receiving and delivery flexibility of trucks. Its unique service advantage compared with coastal waterway shipments is in being capable of handling smaller volume shipments, faster movement of freight and possibly more convenient receiving and delivery. Waterway shipments incur more pilferage than either rail or truck.

Thus railway transport service lies somewhat between highway and waterway in time involved in shipments, load quantities, load size, load weight, and flexibility in receiving and delivering freight. As would be expected, the railway's advantage over highway increases with distance. Similarly, coastal waterway's advantage over rail increases with distance.

The important point is that some shippers handle kind, quantity, size, and condition of products under trade circumstances that best fit the services provided by truck, others that best fit the services provided by rail, and still others that best fit the services provided by coastal vessel. No research studies have been conducted to indicate the makeup and extent of these transport demands in Vietnam.

Some believe a large and immediate increase in nonmilitary freight transport will occur with the cessation of hostilities. Military movement will, of course, decline. Estimates of annual increases in freight transport thereafter, tied to development plans, vary between 8 and 15 percent. If the economy is to embark on a course of development, a 10 percent growth rate seems reasonably conservative. The economy's growth may be sufficient to provide a unique transport demand for rail services over the

long period that would assure near capacity operation at competitive rates with highway transport.

Various estimates have been made of the volume of freight a reconstructed railway could handle. Table 4 provides such an estimate based on present rolling stock. It is somewhat higher than others that have been made, due to recent increases in rolling stock and possibly to differences in assumptions which are explicitly stated in the table. Indications are that the rail system may be capable of moving 2 million M.T. of freight annually. If average hauls were for 400 kilometers this would amount to a capability of moving 800 million M.T. kilometers annually by rail.

The Highway System

There are over 21,000 kilometers of road in Vietnam at present, compared with less than 12,000 at the end of 1957. About 2,800 kilometers of the road in 1957 were classified as asphalt surface, about 5,000 as crushed stone or gravel surface, and about 4,200 as earth surface (table 5). In 1969, 21,041 kilometers of road had 5,950 classified as paved, 3,744 as gravel, and 11,347 as nonsurfaced. Most additions to the system apparently were made in the first half of the 1960's, with maintenance and improvement of existing roads the major effort in the last half.

The major road system tends to crisscross the country in a fashion to cover all areas (figure 2). The coastal region has a combination of highway, railway, and coastal water shipping to serve its transport needs. The Delta region has a combination of highways, inland waterways, and some coastal shipping ports. The Highlands region is served only by highways. The Highlands is sparsely settled; roads are relatively scarce or nonexistent in many areas, but there are only one-fourth as many people per kilometer of road (251) as in the Southern and Central Lowlands regions (with over 1,000 persons per kilometer). The latter two regions, of course, have other modes to boost transport services provided them.

Basic transportation needs in the Delta and Coastal regions are for repairs and improvements of existing transport systems. Potential developments of new agricultural areas in the Highlands probably will require additional roads that penetrate those areas where the development potential is highest. Particularly, this is the case for local assembly of marketable products, i.e., farm-to-market type of roads.

Needed repairs and improvements for hauling freight on the existing road systems have been well documented in previous studies. Shortcomings involve: (1) inadequate roadbed strength that results in rapid deterioration (2-3 years) from freight traffic; (2) inadequately-surfaced road widths (5-6 meters) that cause trucks and buses to hit the shoulders when passing or meeting (this produces a safety hazard, particularly at higher speeds); (3) inadequate capacity and width of bridges in the road network (a total of some 4,500, with half of them being temporary structures of 12 M.T. or

Table 4.--Inventory of rolling stock and freight transportation capacity of Vietnam's railway system, 1972 1/

Type	Number 2/	Individual size	Total freight capacity
			M.T.
Box cars 3/	425	25 - 30 M.T.	11,680
Gondola and hopper cars 3/	260	25 - 30 M.T.	7,150
Flat cars 4/	250	25 - 30 M.T.	6,875
Tank cars 4/	25	25 - 30 M.T. or 6,000 - 8,000 gallons	685
Passenger cars	180	100 persons	---
Diesel locomotives	65	800 - 900 hp.	---
Mechanically refrigerated cars	25	mostly	5/375
Steam locomotives 6/	45		---
Switch engines	10	300 hp.	---
Freight cars, various 6/	250	10 - 15 M.T.	3,125
Trucks	20	7 M.T.	140
Total freight capacity 7/			30,030

1/ Presently available stock that could be made serviceable.
2/ Approximate. Includes U.S. military.
3/ About half are older cars but in fair condition.
4/ About 75 percent are older cars in fair condition.
5/ Assumed 15-M.T. capacity.
6/ Usability questionable--old stock.
7/ Assuming each car made 100 hauls per year, averaging 400 kilometers per haul, carrying 75 percent capacity loads, the present usable freight fleet indicated above would be capable of moving 2 million M.T. of freight an average distance of 400 kilometers per year--or a total freight transportation capacity of 800 million M.T. kilometers. If the older 10-15 M.T. cars listed as questionable were pressed into service with similar assumptions, the annual freight transportation capacity would be increased by about 10 percent.

Note: Inventory data in the table were based on information from various unpublished sources and previous studies. Recent GVN statistics indicate the railway's freight car stock total was over 2,000 in each year from 1965 through 1969, but was given as only 1,048 in 1970. Table estimates of freight stock amount to 960, excluding the 250 old stock. Thus, most recent GVN statistics lead one to suspect significantly higher freight stock available than estimated on the table. The researcher now feels the assumptions (100 hauls, 400 kms./haul, 75 percent capacity load) made originally may be too high. The table is left as original, however, because the Census data indicates his freight rolling stock estimate may be too low.

Table 5.--Vietnam's highways, by surface, type, and region, selected years

Item	1957	1965	1968	1969
	Kilometers of road			
Total	11,985	20,027	20,896	21,041
Surface				
Paved or asphalt	2,792	5,497	5,580	5,950
Crushed stone, gravel	4,974	3,658	3,945	3,744
Earth	4,219	10,872	11,371	11,347
Type				
National	---	3,778	3,747	3,797
Interprovincial	---	2,593	2,593	2,670
Provincial and others	---	12,179	12,988	12,816
Streets	---	1,477	1,568	1,758
Region				
Southern	---	---	11,308	11,443
Central Highlands	---	---	3,933	3,940
Central Lowlands	---	---	5,657	5,658

Source: Transportation Consultants (1966) and Vietnam Statistical Yearbooks, National Institute of Statistics.

less capacity); and (4) overloading of trucks which results in rapid depreciation, heavy repair bills, and road damage (see Bibliography reference 15).

Vietnam's peacetime highway transport costs (both public and private) probably could be lowered considerably by constructing more durable roadbeds and wider surfaced roads; effective regulation of truck loads; and eliminating checkpoint delays. Highways will likely play an increasingly important role in the movement of goods and freight within the country. Truck ownership requires a relatively small financial outlay, little special skill in operation, and can be financed rather easily. Most costs are tied directly to operation. Thus, trucks are an opportunity for individual entrepreneurship, can be used to haul a wide variety of goods and freight, and have high flexibility in scheduling and operation. The most important disadvantage of highway transport in peacetime Vietnam probably will be its drain on foreign exchange--trucks, parts, fuel, and oil must be imported.

Truck highway transport has increased substantially since the mid-1960's. In 1964, there were about 33,000 trucks registered (table 6). About 60 percent were light trucks, under 3-1/2 M.T. capacity. By 1970, there were almost 90,000 trucks in use, according to GVN statistics, with light trucks still about 60 percent of the total. The increase in trucks in use from 1966 to 1968 (2-year period) was 23 percent; from 1968 to 1969, 30 percent and from 1969 to 1970, 50 percent. Consequently, the 10 percent projection used to estimate the 1972 numbers would seem to be modest.

Under the assumption specified in table 6, the present highway moving stock is capable of transporting about 57 million M.T. of freight annually, amounting to a total movement of 10.6 billion M.T. kilometers. These data suggest that truck transport capacity alone is capable of moving eight times the agricultural transport requirements estimated earlier.

Table 6.--Vietnam's highway transportation capacity, selected years

Year	Trucks by kind 1/			Carrier tricycles
	Total	Light 2/	Heavy 3/	
1964	32,821	19,909	12,912	--
1966	37,327	20,049	17,278	12,529
1968	45,897	24,214	21,683	25,512
1969	59,585	31,514	24,071	30,668
1970	89,693	53,858	35,835	41,390
1972 4/	98,662	59,244	39,418	--
Transport capacity: 1972 5/				
Freight--Mil. M.T.	57.2	17.8	39.4	
Million M.T. Km.	10,550	2,666	7,884	

1/ 1964 data from the 1966 Transportation Consultants study based on trucks registered. 1966 through 1969 data from recent GVN statistics of motor vehicles in use.

2/ Classed as less than 3-1/2 M.T. and includes those classed as 3-wheels in 1964 and those classed as others in later years.

3/ 3-1/2 M.T. and over.

4/ Estimated 10 percent above 1970.

5/ Assumptions are that light trucks average 1-1/2 M.T. per load, 150 km. per haul and 200 hauls (30,000 km.) per year; heavy trucks average 5 M.T. per load, 200 km. per haul and 200 hauls (40,000 km.) per year.

The Waterway System

Two waterway systems serve domestic transport in Vietnam. The inland canal and river network is almost entirely within the Mekong Delta. It is a major means of moving produce and freight within the Delta and between Saigon and the Delta. Approximately 65 percent of the population lives in the Delta. About 80 percent of the rice and 90 percent or more of the nation's agricultural output are produced here. Road transport in the Delta has increased in recent years. However, most freight movement before the mid-1960's, and unofficial estimates indicate 50 percent or more today, is by inland waterway. Inland water transport likely will continue to be a most important aspect of the nation's market economy. This section is devoted mainly to the inland waterway system. However, coastal shipping is important in potential development of the nation's economy.

The inland system consists of about 4,780 kilometers of canals and rivers. However, most traffic moves over routes that total less than 2,000 kilometers of waterway. Warfare has taken its toll. Dredges have been destroyed, maintenance dredging has been neglected, and Viet Cong sniping and sabotage have detoured traffic around some areas. 6/ Traveling by convoy has slowed waterway transport considerably along important routes. Insecurity, delay in shipments, and fear of war losses have been instrumental in recent shifts from waterway to highway in the movement of freight. In peacetime it would be expected that the inland waterway system would increase in competitive strength compared with highways.

Table 7 contains estimates of the inland waterway's present operating craft and its potential freight transportation capacity under peacetime conditions, along with the assumptions used in computing the data. It is estimated over 9 million M.T. of freight could be transported by inland waterway with present craft. 7/ Assuming average distances of 125 kilometers for small craft and 250 kilometers for larger vessels, this represents a total potential to move over 2 billion M.T. kilometers of freight (table 8).

While this estimate is larger than others made within the last 3 or 4 years, it is likely very conservative. The Delta waterway system formerly carried the major part of all freight shipped within and out of the region to Saigon. It currently is estimated to carry at least 50 percent of all such freight. Since the major portion of the population resides there and a high proportion of all agricultural production is in the Delta and Eastern Region, it is likely that about three-fourths of all freight transport in the entire country occurs in the area served by the inland water system.

6/ It is reported that barge convoys from Bac Lieu to Saigon now travel 384 kms.; previously, the normal distance was 276 kms.

7/ As pointed out by USAID engineers, the barge fleet could easily be enlarged in response to increasing demand for water transport service.

Table 7.--Moving stock inventory of Vietnam's inland waterway system, selected years

Type of vessel	1965		1968		1970		1972 1/	
	Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage
		M.T.		M.T.		M.T.		M.T.
Powered:								
Steam towing	--	--	3	88	3	88	3	88
Tugs and motor towing	--	--	97	1,976	139	3,076	190	4,205
Motor propelled barges	--	--	56	11,411	61	12,692	70	14,580
Junks and barges greater than 50 M.T.	--	--	167	29,851	194	35,589	225	41,280
Motor propelled junks, sampans, etc., less than 50 M.T.	--	--	3,114	16,374	3,396	19,131	4,970	28,067
Total powered	--	--	3,437	59,223	3,793	70,576	5,458	88,220
Dumb:								
Wooden: Under 50 M.T.	370	11,361	465	14,533	475	14,803	600	18,650
51-150 M.T.	223	11,855	548	41,260	551	41,675	690	52,200
151-250 M.T.	197	39,354	236	46,374	229	44,886	240	48,150
More than 250 M.T.	40	11,705	55	16,668	51	15,258	65	19,550
Steel : Under 50 M.T.	44	1,156	59	1,627	68	1,937	95	3,190
51-150 M.T.	124	11,716	133	12,956	134	12,942	190	18,790
151-250 M.T.	81	15,150	102	19,374	105	20,125	138	26,850
More than 250 M.T.	67	24,799	147	52,238	158	48,676	205	63,000
Total dumb	1,146	127,096	1,745	205,030	1,771	200,302	2,220	250,380

1/ Official statistics show far more craft registered than in use. Berger Associates' study quoted a Directorate of Navigation official as saying the actual number in use was at least 10 percent above reported figures at that time. Consequently, 1972 tonnage is assumed 25 percent larger than 1970, adjustments in number of craft by kind are made in terms of tonnage figures. Thus, it would appear 1972 estimates are conservative and that they may understate, particularly the powered craft actually in use.

Source: Official GVN statistics for craft reported in use at end of year for data 1965 through 1970.

Table 8.--Vietnam's potential inland waterway freight capacity*

Type of craft	Estimated transportation potential	
	Tonnage	Distance capacity
	1,000 M.T.	Million M.T. km.
Sampans, etc.	1,404	176
Other powered craft	1,504	376
Dumb craft	6,260	1,565
Total capacity	9,168	2,117

* Assumptions: Sampans, outboard motor craft, etc., have an average load of 50 percent their tonnage capacity and can make 100 trips annually for an average distance of 125 kilometers. All other craft assumed to make 50 trips annually for an average distance of 250 kilometers, averaging 50 percent of their tonnage capacity.

Transport Capability and Requirements

The present inventory of trucks, rail cars, and waterway vessels are probably capable of moving an estimated 70 million M.T. of freight annually within Vietnam. This assumes that the basic fixed means (roads, rail, and waterways) are established and that the transporters are unhampered in providing freight transport service. This amounts to a total freight movement capability of about 15 billion M.T. kilometers (table 9). About 72 percent of the capability is by truck, about 14 percent by inland waterway, about 5 percent by rail, and about 9 percent by coastal vessel. This is a rough estimate. It abstracts most questions concerning the condition of moving stock and highways, railways, and waterways. It applies to the present only. Nevertheless, it gives a basis for evaluating whether capability is sufficient to care for requirements in the immediate postwar period.

The 1966 Transportation Consultants study showed total freight transported in 1964 at 16.5 million M.T., for a total movement of 3.6 billion M.T. kilometers. Total figures for 1965 were only slightly less. About 15 million M.T. (or 91 percent of the total) were estimated to have moved by truck, although only 83 percent (3 billion) of the 3.6 billion M.T. kilometers of movement was by truck.

The 1970 Berger study estimated movement of freight by truck in 1970 at 5.1 billion M.T. kilometers. Assuming an average haul of 200 kilometers, this represents a total of 25.5 million M.T. of freight transported by truck. Their basis evidently was a 1958 estimate of 3 billion M.T kilometers of freight moved, to which was applied a 4 percent annual growth rate. Berger's estimate suggests some 28-30 million M.T. of freight was moved in 1970, or a total movement of slightly over 6 billion M.T. kilometers.

Table 9.--Transport capacity of Vietnam's transportation system

System	Freight transport capacity	Freight distance capacity	Regions served
	Million M.T.	Billion M.T. km.	
Railway	2.0	0.8	Coastal
Inland waterway	9.1	2.1	Delta
Highway	50.3	10.6	Delta, Coastal, Highlands
Coastal waterway 1/	1.5	1.3	
Total	69.9	14.8	

1/ Assumes coastal vessel tonnage capacity of 42,000 M.T. making 70 hauls per year (35 round trips--about 3 per month) with 50 percent load and averaging 900 km. per haul.

In view of recent estimates from other sources, the Berger estimate is considered to be liberal for present freight traffic between urban and village communities. Yet it is considerably below the estimate in table 9 of the transportation system's freight-carrying capability. The margin would seem more than ample to care for problems of peak monthly movements during the year. It must be recognized that far more capacity is needed to provide freight movement under wartime conditions than under those assumptions used to derive the data in table 9.

The evaluation of agricultural transport needs in 1975 presented in the previous section indicated about 7 million M.T. of produce and fertilizer would move internally. There is widespread belief that agricultural products make up most of all the freight movement in Vietnam, especially so in peacetime. However, considerable other freight does move. If development occurs, nonagricultural goods will, by necessity, make up an increasing proportion of total transport.

The opinion has been expressed that, with cessation of hostilities, transportation demand will register an immediate increase and will continue to grow at a high annual rate into the foreseeable future. From 8-14 percent annual rates of increase are suggested as reasonable expectations. Nevertheless, Vietnam seems to have the moving stock necessary to handle the immediate postwar demands. However, its condition is such that costs may be considerably higher than with more durable and efficient modes and equipment.

The expectation of an immediate postwar jump in transport may not be realized. Market trade can be expected to increase the postwar demand for freight transport, but it may be offset by a decline in military traffic. A relatively large annual rate of increase in freight transport, once the

country settles to peacetime operation, is a necessary consequence of economic growth. An annual increase in freight movement twice the size of the annual growth in the overall economy seems a reasonable expectation in the early years of development. Anything less than that may indicate the economic growth is a population rather than a production phenomenon.

In summary, it appears that there is sufficient basic transport means (abstracting from condition and cost) to serve the agricultural transportation needs of the Delta and Coastal regions where most of the present people and markets are concentrated. There are alternative modes in both regions. Further, highways penetrate the Highlands to tie together most of the major urban centers there. Fortunately, most of those areas with the greatest potential for new agricultural development lie near major urban centers and the main highway network. Consequently, it would seem the basic needs in the immediate postwar period are farm-to-market roads in the new agricultural areas, if they are to be developed, and repair and improvement of the existing road, waterway, and rail networks in those areas where their use is critical to transportation requirements.

TRANSPORTATION RATES AND COSTS

One purpose of this transportation study was to provide transport cost coefficients for a general production and marketing study model of Vietnamese agriculture. Most produce moves by commercial conveyance. Secondary data on rates actually charged for freight transport were very limited. Consequently, it was necessary to compile data from field interviews with Vietnamese Government officials, other public agents, wholesale dealers, truck operators, personnel of contract shipping firms, and others to obtain the data used in this section.

Theoretic Background

Transportation produces place value. That is, transporting a product from a place where it sells for a low price because of its abundance to a place where it sells for a high price because of its scarcity increases its economic value. Demand for place value (transportation) in a free market may be considered as the price of the transportable product in the deficit area minus its price in the surplus area--the price margin. Supply of place value (transportation) is measured by the cost of providing the transport service from the surplus to the deficit area. Presumably, with sufficient knowledge and competition, movement of goods from the surplus to the deficit area will continue until the rising price in the surplus area (as a consequence of decreasing supplies) and the declining price in the deficit area (as a consequence of increasing supplies) approaches the price margin (demand price for transportation) that is just sufficient to pay the cost of transport.

Anything that lowers or increases the difference between the deficit and surplus area prices of a product has an impact on the demand for the transport service. Anything that lowers or increases the cost of transportation also will affect the amount transported. These economic conditions and relationships provide the economic criteria for evaluating transportation.

Procedure

Field work was mainly confined to water and road movement. Air and rail transport rates were not included in requests for information from respondents. Present rail transport is over only a few short-distance links and is mostly military and nonagricultural materials. Rather insignificant amounts of agricultural products are shipped by air, even in developed countries. Consequently, it was felt that little operational data useful in this aspect of the study would be generated for either rail or air transport.

Large quantities of farm products are transported by foot, motorcycle, pedacab, oxcart (sometimes pulled by man rather than ox), tri-lambretta, and other small quantity modes. Particularly is this true from farm to original gathering point and from wholesale market to retail stands. These modes were excluded from this study because the larger modes are most pertinent to an economy's development, and also due to the obvious difficulty of getting either rates or amounts involved in such movement.

There is no need to belabor the difficulty of collecting data on transport costs in Vietnam, and the even greater difficulty in evaluating the reliability of data one obtains. There are some basic reasons for such difficulties. Transport costs are subject to wide variation. They vary seasonally due to seasonality in production and movement and seasonality in consumer demand. Several examples were given of transport charges for particular products that were considerably higher just prior to Tet than afterward. Rates vary geographically because of difference in labor cost, condition of the transport routes, relation of the supply of transport facilities to their demand, and differences in produce and materials hauled. Perhaps most important of all, rates vary in an unpredictable and unmeasurable manner due to changes in security conditions over the routes traveled.

Rates vary even in the same location for the same products hauled by the same transport firm, depending on the nature of the contract. A large wholesaler with continuous need for transport usually contracts a firm to move his products over a period of several months. He gets more favorable rates than the small scale occasional shipper who must bargain for transport when the produce is ready to move and who is financially jeopardized if it is delayed. Informants sometimes specified rates quoted were for business men who had contracts and close business relations with the trucking firms. It was reported that the occasional shipper may pay double or triple those contract rates.

Those closely associated with transportation and knowledgeable on rate-setting understandably find it difficult to describe the going or average rates due to those conditions described. No doubt, many feel an added hesitancy to provide data, or a willingness to distort it, due to the illegal costs associated with the rate structure. It is commonly acknowledged such costs exist. Their amounts are considered not safe to reveal by those who pay them, consequently are a matter for refined speculation. Too, it is suspected that some respondents use bargaining techniques in answering questions about rates. They quote higher rates than prevail as a sort of "asking" price technique, with the idea it may determine what they will get in the future.

One needs to recognize these negative aspects and make adjustments accordingly while securing guideline data. Estimates from different sources serve as a comparative gauge of reliability. Information about the conditions of transport rate setting, the relation between transport costs, and the basis of rate determination helps explain divergencies and make adjustments. Too, there is a general fund of knowledge on transport costs from past studies in various countries. These become both a research tool and a research input in a study such as this. One judges, interprets, and conditions collected data in terms of known levels and relationships. Such arbitrary adjustments were necessary in the structure of rates and costs presented in the following pages. An effort was made to reflect real life conditions as closely as possible.

Rates for Grain, Feed, Fertilizer, and Boxed and Bagged Goods

Grains, feed, fertilizer, as well as bagged and boxed goods generally are transported under the same rate. Consequently, quotations for one suffice for others in this group.

Table 10 was constructed from data collected only for rice movement. The relative importance of rice in the total agricultural picture justifies special consideration and, by limiting the data to rice, its pattern of movement is indicated. Too, the rate data for rice and for hogs, poultry, and vegetables (in table 11) serve to point up some departures from the general rate structure given in table 12.

Domestic rice entering internal market channels (Delta surplus production) rather consistently moves to Saigon before being shipped north to deficit provinces. Can Tho is considered a collection point, but much of the rice from Delta provinces bypasses Can Tho and moves directly to Saigon. Direct shipments that bypass Saigon in the movement to northern provinces are rare. They are mainly by coastal vessel when they occur.

Movement of domestic rice from Saigon is usually by truck when the destination is to inland points in the lower part of the highlands. It moves by both truck and coastal vessel to such ports as Phan Rang and Qui Nhon.

Table 10.--Rice movement and transportation rates per M.T. kilometer, Vietnam, 1972*

Origin and destination	Road distance	Transport rates	
		Water	Truck
	Km.	VN$/M.T. km.	
Long My - Can Tho	60	---	7.0
Vi Thanh - Can Tho	58	---	7.0
My Tho - Can Tho	105	7.5	11.0
Ca Mau - Can Tho	145	9.0	13.0
Can Tho - Saigon	169	6.0	9.7
Khanh Hung - Saigon	231	5.7	8.0
My Xuyen - Saigon	235	5.5	9.0
Rach Gia - Saigon	248	1/3.5	9.5
Bac Lieu - Saigon	280	5.0	3/---
Long Xuyen - Saigon	190	6.3	9.5
Ha Tien - Saigon	338	1/3.5	---
Ca Mau - Saigon	315	7.9	11.0
Long My - Saigon	230	---	10.0
Saigon - Nha Trang	450	2/4.0	8.0
Saigon - Cam Ranh	395	2/4.0	8.0
Saigon - Qui Nhon	686	2/2.6	---
Saigon - Da Nang	971	2/2.3	10.3
Saigon - Dalat	305	---	9.0
Nha Trang - Ban Me Thuot	210	---	11.0
Nha Trang - Bao Loc	283	---	12.0
Nha Trang - Dalat	205	---	9.0
Nha Trang - Pleiku	379	---	10.5
Nha Trang - Kontum	427	---	11.5
Da Nang - Tam Ky	64	---	20.0
Da Nang - Quang Tri	164	---	17.0
Da Nang - Hue	110	---	16.5

* Based on respondent reports from field survey.

1/ Rate for coastal movement of large tonnage by barge. Inland rate of VN$8.5/M.T. km. quoted from Rach Gia to Saigon and a coastal vessel rate of VN$2.5/M.T. km. quoted from Ha Tien to Saigon.

2/ Coastal vessel.

3/ It has been estimated that two-thirds of the rice shipment from Bac Lieu moves by boat--200-300 M.T. boat.

Table 11.--Movement and transportation rates per M.T. kilometer for selected agricultural commodities, Vietnam, 1972

Origin and destination	Road distance	Transport rates					
		Market hogs		Poultry		Vegetables & fruit	
		Water	Truck	Water	Truck	Water	Truck
	Km.	VN$/M.T. km.					
Can Tho - Saigon	169	8	17	--	12.5	6	11
My Tho - Saigon	70	--	45	--	--	--	--
Long My - Saigon	230	--	13	--	11	--	9.5
Bac Lieu - Saigon	280	6	--	5	--	6	--
Long Xuyen - Saigon	190	--	--	--	--	--	1/15
Bien Hoa - Saigon	30	--	88	--	--	--	--
Xuon Roc - Saigon	81	--	41	--	--	--	--
Saigon - Nha Trang	450	--	14	--	11.0	--	10.0
Dalat - Saigon	305	--	--	--	2/16	--	11
Dalat - Nha Trang	205	--	--	--	--	--	14
Dalat - Da Nang	730	--	--	--	--	--	13.7
Dalat - Hue	854	--	--	--	--	--	13.0
Dalat - Ban Me Thuot	395	--	--	--	--	--	12.7
Qui Nhon - Pleiku	141	--	13	--	--	--	--
Qui Nhon - Hau Bon	150	--	14	--	--	--	--
Qui Nhon - Kontum	189	--	13	--	--	--	--
Da Nang - Hue	110	--	27	--	--	--	--

1/ Watermelons--said to vary from VN$5/melon before Tet to VN$3/melon after Tet.

2/ The rate was quoted for a small truck with a load capacity of 1,500 birds. A volume sufficient to support larger shipments would probably draw around 12VN$/M.T. km.

Table 12.--Truck transportation rates for agricultural products related to distance, Vietnam, 1972*

Distance 1/	10-M.T. truck rates	Truck rates per km.	Simulated rate per M.T. kilometer for specified load 2/			
			10-M.T.	8-M.T.	6-M.T.	4-M.T.
Kilometers	VN$		VN$/M.T. km.			
12.5	8,000	640	64	80	107	160
37.5	9,000	240	24	30	40	60
75	12,000	160	16	20	27	40
125	15,000	120	12	15	20	30
175	17,500	100	10	12.5	16.7	25
225	22,000	97.7	9.8	12.2	16.4	24.4
275	26,000	94.5	9.5	11.8	15.8	23.6
325	30,000	92.3	9.2	11.5	15.4	23.1
375	34,000	90.7	9.1	11.3	15.2	22.7
425	38,250	90.0	9.0	11.25	15.1	22.5
Above	---	90.0	9.0	11.25	15.1	22.5

* Rates are arbitrary selections but were designed to give the best generalization possible of field data gathered for the study.

1/ These are mid-point distances of distance categories used in developing the data. They are given here in place of the categories so that those using the data can more readily adjust rates for distances between mid-points.

2/ A so-called 10-M.T. truck can carry 10 M.T. of rice, fertilizer, etc., but a truck load of market hogs is about 5 M.T.; a truck load of poultry is 6-7 M.T.; a truck load of vegetables is 7-8 M.T.

Large amounts of rice were imported during the latter part of the 1960's. Arrivals were increasingly at coastal ports rather than Saigon. Only about 20 percent of the 570 thousand M.T. imported in 1970 arrived at the Saigon port. Thus, imports tended to join domestic rice from Saigon at coastal ports and were distributed inland by truck.

There are some qualifying conditions that should be kept in mind when comparing rice transport rates in table 10 with the basic rate pattern shown in table 12. First, Delta respondents said actual rates were lower than the GVN official cost rate 8/ because there were "more trucks than needed" in the area. In contrast, respondents in other regions said the GVN official rates were too low relative to actual rates that had to be paid.

In general, rates tend to be lower in the southern than in the northern part of South Vietnam. They tend to be higher on shipments into the highlands than on shipments along the coast or in the Delta. A relatively heavy supply of trucks as well as waterway competition in the Delta, competition from water vessels in coastal shipments, and poor road conditions in parts of the highlands explain a part of these divergencies.

Rates for rice transport in table 10 are based on quoted rates and reflect local as well as wartime conditions. There is a considerable risk cost imbedded in them. Given a peacetime environment and a rather high level of trade (economic and development), these rates likely will adjust toward the pattern shown in table 12.

Rates for Swine, Poultry, Fruit, and Vegetables

The market swine truck transport rate is roughly double that of rice, the poultry rate is 45-65 percent greater than the rice rate, and the rate for fruits and vegetables is 25-40 percent above the rice rates (table 11).

While field collected rates for rice transport varied widely, there were enough observations so that extremes stood out and concentrations allowed one to zero in on the rates given in table 10. This is less the case for data in table 11. It does, however, adequately summarize the data collected in the field.

Hogs moved to collection and slaughter points in the Delta. The surplus above local needs was shipped live to the Saigon slaughterhouse. Hogs also are drawn from nearby provinces into the Saigon slaughterhouse. There is also movement from coastal producing areas into the highlands. For example, one source estimated that Qui Nhon ships about 800 hogs a month to Pleiku, 100-150 to Kontum, 70-100 to Phu Bon and 80 to Darlac.

8/ The GVN official cost rate guide is given later in this report.

A 10-M.T. truck carries from 50-60 market hogs weighing from 70-120 kilograms each, a load capacity of about 5 M.T. The transport rates for market hogs, for distances exceeding 100 kilometers, varied from VN$13 to VN$27/M.T. km.

Poultry are transported live, mainly from the Delta to Saigon and from nearby provinces into Saigon. Estimates of a truck load varied from 1,500 birds in a semi-truck to as high as 5,000-6,000 (questionable) in the common 10-M.T. truck. Lacking more precise knowledge it is assumed that 3,000-4,000 birds, or roughly 6-7 M.T. of weight, comprise a load in the 10-M.T. truck. Rates given for poultry are fairly uniform at about VN$12/M.T. km.

Vegetables mainly move from the Dalat area to major coastal and highland cities including Saigon, and from the Delta to Saigon. There were more observations to support the vegetable rate selections in table 11 than for market hogs and poultry. Rates are fairly uniform, varying from VN$9.5 to VN$15/M.T. km.

Miscellaneous Rates

A few additional transport items may be of interest. Eggs were shipped from Dalat to Saigon in truck loads of 100 cases (360 eggs per case) at a cost of VN$18,000-20,000, or VN$59-66 per kilometer. A case of regular sized eggs weighs about 21.32 kilograms per case. Consequently, the load of 2.132 M.T. costs VN$27.7-30.8/M.T. km. Large losses were reported on eggs transported by trucks.

A commercial hatchery at Dalat shipped baby chicks to Saigon by air freight in boxes of 100 chicks, each box weighing 4 kilograms, at a freight cost of VN$25 per kilogram or VN$1 per chick (the cost was VN$15/kg. before Tet). This serves as evidence that special demands or shipping requirements make even costly air transport feasible for some products.

General Rate Structure

More than 200 separate freight rate quotations for different modes, various products, and widely varying distances were obtained, along with comments and assessments about factors affecting rates, relationships between rates, and other such useful information from knowledgeable people associated in some capacity with the transportation industry.

The data reflect a wide range in rates between common origin and destination points. Road condition, wartime security conditions, lack of rate information by shippers, frequency and volume of shipments--even the personal relationship between shipper and transporter--are factors accounting for such variation between common points. It is

important to recognize that rates do vary widely and the rate a person pays depends on his bargaining position at the time the rate is set. 9/

The more important patterns in movement of agricultural products are indicated in the rate data. The effect of distance is noticeable with shorter hauls incurring higher rates per M.T. kilometer than longer hauls. Rates on movements from the Delta, Saigon, and lower coastal points into the highlands and northern provinces show influences of road and security conditions as well as less-than-full-load backhauls.

Respondents in the Delta region often generalized that water rates "are about 30 percent less than truck rates." Actual truck rates quoted generally were about 50 percent above the water rates quoted. For example, the range in commonly quoted inland water rates for rice from Delta points to Saigon was VN$5-7/M.T. km., compared with the range in truck rates of VN$8-10/M.T. km.

Shipments by truck may be less costly, even at 50 percent higher rates, and are more convenient and faster under present conditions. Money tied up in a 10-M.T. load of rice represents foregone interest amounting to slightly less than VN$3,500 per day at a 20 percent rate. Two days interest may exceed the additional cost of shipping by truck. Wholesale merchants who deal in large quantities of rice are said to be acutely conscious of interest costs. Moreover, they prefer, as do their customers, faster delivery to lessen the risk of an adverse price change.

Various time estimates were given for shipment by truck and boat. These estimates varied widely but, apparently, 2 or more days difference does occur from some parts of the Delta to Saigon. One knowledgeable source said it took 3 days by truck for a round trip from Can Tho to Saigon but it took 3 days each way by boat and an additional 3 days for loading. Presumably this was by barge.

Water distances from some of the shipping points in the Delta are considerably greater than road distances due to the round-about-way taken for security reasons and condition of some canals. Traveling by convoy drastically reduces the speed of motorized water transport, especially with nonmotorized craft in the convoy. That problem, of course, does not as seriously affect trucks. Possibly, the greatest delay for trucks is at checkpoints before entering Saigon.

9/ If the shipper is a small operator, shipping only occasionally, and is pressed either by the nature of his product or by customers on delivery, he is vulnerable for a high rate unless he knows other truckers willing to bid the rate down. Where truck owners strongly compete for a limited volume of freight, particularly among those with older trucks written off as an investment, the bargaining rates may drop considerably below average costs. If the owner-driver has no alternative employment he may accept a rate that represents a small wage above gas and oil expense.

Risk of cargo loss apparently is greater by boat than truck, due to less secured conditions of waterways. Pilferage is higher. Water transport likely will improve considerably under peacetime conditions and will lower water rates relative to land rates. Under existing conditions, however, there seems to be sound economic reason for the recent shift from water to land transport on shipments from the Delta.

Truck operators usually bargain on a per truck rather than a load-weight basis. The rate may be quoted per M.T. or some other basis, but the trucker's decision is determined by the total amount he will get for the truck haul.

Over 150 separate truck rates were obtained from respondents. These rates provided a basis for determining a general rate structure related to distance (table 12). The rates were arrayed by distances, averages for various distance categories were computed and these were used along with group concentrations to develop the data in table 12. The data are the best generalization possible of existing rates for truck transportation of agricultural products in 1972. The data represent the basic structure of truck rates; data are generalized and do not reflect variations resulting from location, road condition, security, and other factors.

Rates are relatively high per kilometer for short distance hauls. Loading and unloading time is a major factor since the truck and operator are occupied, although not hauling. As distance increases, loading and unloading time become a less significant part of total time.

The truck rate levels off to about VN$90 per kilometer at about 400 kilometers and is linear at that rate with distance above 400. The rate per M.T. kilometer declines rather rapidly at first from the high rate for short distances, but more gradually as distances reach and exceed 100 kilometers. The rate per M.T. kilometer reaches a minimum around 400 kilometers and is maintained at distances beyond that. A 10-M.T. truck is considered capable of hauling 10-M.T. of rice, grain or fertilizer. However, the weight/volume ratio differs for many other types of loads. A load of market hogs comprises 50-60 head weighing from 80-100 kilograms per head and amounting to about a 5-M.T. load. A load of poultry comprises about 3,000 head (more-or-less) weighing 6-7 M.T. An average load of vegetables may be 7-8 M.T. Respondents sometimes quote all hauls as 10-M.T. or 7-M.T. loads, depending on the size of truck and regardless of the kind of produce hauled, contrary to other information and data provided. There was some indication smaller trucks were involved in the Can Tho area than in Saigon and the north.

It is useful to consider how factors other than distance will affect rates. The condition of the roads can be related to costs in a general fashion. Roads in Vietnam are rather universally in poor condition. Some are worse than others. Inadequate roadbeds or freight loads heavier than were intended for a particular roadbed cause rapid deterioration and create the need for road repairs. But road repair is not the only cost, and may not be the largest cost, of inadequate roadbeds.

A part of truck depreciation and repairs also represent a cost allocation to poor roads. As road conditions worsen, truck life decreases and repair bills increase. In general, it is estimated that truck operating costs are 40-50 percent higher on gravel than on paved roads and are 75-125 percent higher on earth roads than on paved roads. The higher truck rates in the highlands, in northern provinces and between some points in the Delta are influenced by poor road conditions.

The Government of Vietnam annually determines an official transport rate for guidance and use in transport bids on government supplies and for other government purposes. Standards for computing individual cost items were determined in 1969. The cost per M.T. kilometer computed on each item was shown in table 13. The official total rate was VN$7/M.T. kilometer in 1969, VN$10 in 1970, VN$13 in 1971, and VN$14.70 in 1972. The item breakdown of the 1972 cost shown in table 12 is not official but was computed by using 1969 percentages.

GVN standards are based on a 3-M.T. truck, a 70 percent load factor, and other assumptions given in table 13. Data and information in the right-hand section of table 13 give the author's estimated costs of a 10-M.T. truck operation in 1972, along with the relevant assumptions. The estimate amounts to VN$58.4/kilometer or to VN$11.7/M.T. kilometer, assuming a 50 percent load factor. The 50 percent load factor is considered reasonable in view of less-than-10-M.T. loads when hauling poultry, hogs, vegetables, etc., and the partial load and empty returns sometimes incurred in truck transportation.

The basic cost structure estimated for table 13 suggests that the simulated rate data shown in table 12 is not unduly high compared with costs of operating truck transport units and considering risk and other factors that, at times, are involved in providing the transport service.

Loading, Unloading, and Other Costs

Loading and unloading costs quoted by respondents varied widely between different areas and terminal shipping and receiving points. Unexplained differences at the same points led to closer study of their basic structure.

Labor is the major cost item in loading and unloading. Available data show wage rates differ markedly with differences in urban centers, types of labor, sex of laborers, and (apparently) individual bargaining.

Women apparently get less than men for similar jobs. In the Saigon area, men working in a feed mill make from 50 to 100 percent more than women working there. Unskilled female labor drew only half to two-thirds the wage of unskilled male labor from the same employer in Dalat. These wage rates were not dissimilar to published data, although the differences between male and female wage levels were somewhat greater.

Table 13.--Estimated truck freight cost per metric ton kilometer, 1972

Cost item	GVN official rate (3-M.T. truck)			Estimated costs (10-M.T. truck)	
	1969 basis 1/	1969	1972	1972 basis 2/	1972
		VN$/M.T./km.			VN$/km.
Depreciation	VN$500,000 ÷ (250,000 km. X 3 M.T. X 0.7 load)	.952	2.014	VN$3,200,000 ÷ 250,000 km.	12.8
Maintenance	VN$50,000 ÷ (50,000 km. X 3 M.T. X 0.7 load)	.476	1.000	VN$100,000 ÷ 50,000 km. 6/	2.0
Gasoline	20 liters per 100 km. @ VN$9.68 per liter 3/	.922	1.955	50 liters per 100 km. @ VN$30 per liter 7/	15.0
Tires and tubes	4 X VN$8,000 ÷ 30,000 km. 4/	.508	1.073	VN$82,000 ÷ 30,000 km. 8/	2.7
Personnel and management	5/	2.760	5.836	VN$624,000 ÷ 50,000 km. 9/	12.5
Interest	10 percent of sum of items above	.562	1.191	10 percent of truck depreciation cost	6.4
Tax and insurance	Assumed by GVN	.772	1.631	12 percent of total other costs	7.0
Total cost/km.		--	--		58.4
Total cost/M.T. km.		6.952	14.700	VN$58.4 ÷ (10 X 0.5)	11.7

1/ The GVN basis was determined officially for individual items as shown in 1969. Only the total of VN$14.70 is official for 1972 with individual items allocated by their 1969 percentages. All GVN data assumes (1) an initial truck cost of VN$500,000, (2) a 5-year and 250,000 km. life, and (3) a 70 percent load factor.

2/ 1972 costs per kilometer for the 10-M.T. truck operation assumes (1) initial truck cost at VN$3,200,000, (2) a 5-year and 250,000 km. life, and (3) a 50 percent load factor. Partial or empty backhauls and less than 10-M.T. loads on such cargo as livestock, vegetables, and poultry indicates a 50 percent load factor.

3/ VN$9.68 X 20 = VN$193.6 ÷ (100 km. X 3-M.T. X 0.7 load factor).

4/ The cost is VN$1.0667 per km. A 3-M.T. truck with 0.7 load factor carries 2.1 M.T. Therefore, VN$1.0667 ÷ 2.1 M.T. = VN$.508.

5/ Average wage rates were VN$13,200 per month for driver and VN$8,500 per month for helper. The custom is to pay an extra month wage to workers at holiday season. Therefore, VN$21,700 X 13 = VN$282,100 + VN$7,700 (management allocation) = VN$289,800 ÷ (50,000 km. per year X 3 M.T. X 0.7 load factor) = VN$2.760.

6/ Annual maintenance estimated to average VN$100,000 annually during truck life.

7/ The 50 liters per 100 km. (roughly 4.7 miles per U.S. gallon) was estimated as average for a full load. It was used (even though a 50 percent load factor would mean half the annual km. traveled was without load) to provide a compensation factor for oil and other such expenses.

8/ A set of tires was estimated to cost VN$82,000 and assumed to last 30,000 km.

9/ 1972 monthly wages were estimated at VN$30,000 for drivers and VN$18,000 for helpers. Total computed on 13-month basis.

Source: Director of Cabinet, Ministry of Transportation, GVN, for the 3-M.T. truck cost. The 10-M.T. truck costs are the author's estimates based on data and information from field contacts in Vietnam.

Published data by the National Institute of Statistics indicate wages of skilled male workers were more than 50 percent greater than skilled female workers in Saigon in 1970. Similar data for the central region showed male wages were double female wages, although only one-third higher in the unskilled category. Women do much of the work of loading and unloading agricultural produce for transport.

Wage rates for women were VN$350-450/8-hour day in Saigon feed mills, compared with VN$500-1,000/day for men. In Dalat, unskilled women were said to earn about VN$250/day while unskilled men drew VN$360-600/day compared with VN$1,000-1,200/working day in Can Tho.

Data in table 14 show daily wages of skilled workers in transportation. The data are official GVN statistics through 1970. The projections for 1971 and 1972 are considered to be liberal, about the maximum increases likely to have occurred.

Table 14.--Average daily wages of skilled workers in transportation, Vietnam, 1966-72

First half of	Saigon	Southern Vietnam	Central Lowlands	Central Highlands
		VN$		
1966	134	148	194	260
1967	254	291	336	543
1968	324	327	368	650
1969	385	404	370	670
1970	441	555	664	980
1971 1/	604	760	910	1,343
1972 1/	827	1,041	1,246	1,839

1/ Projections based on a 37 percent annual rate of increase.

Source: Vietnam Statistical Yearbook, 1970, National Institute of Statistics, pp. 296-97 for data 1966 through 1970.

Field estimates for loading and unloading grains, feeds, fertilizers, and such products varied from less than VN$50 to VN$1,000/M.T. for each operation separately. The vast majority fell between VN$100 and VN$500/M.T.

How do these quoted rates compare with labor costs? The highest wage quoted for an 8-hour day was VN$2,000 and 6 man hours of labor was the highest (among the few) estimates of time required to load (or unload) 10 M.T. of bagged material. These provide a labor cost to load (or unload) such materials as rice, feed, fertilizer, etc., of VN$150/M.T. If wages of VN$500 per working day are used, the labor cost is reduced to VN$37.5/M.T.

Thus respondents' estimates of loading and unloading costs include a large truck operator's margin, include other than labor costs, involve higher labor costs than are indicated by wage data, or were purposely distorted. The latter does not appear likely. Many of the responses were comparable with those from reportedly reliable sources.

The following represents the respondents' cost estimates for loading and unloading grain, fertilizer, feed, and bagged and boxed goods at selected points:

Location	VN$/M.T. to load or unload
Saigon	250 - 350
Can Tho	220 - 260
Nha Trang	230 - 300
Qui Nhon	300
Dalat	100
Da Nang	150 - 400
Long Xuyen	300
Bac Lieu	175

One respondent at Can Tho broke the loading cost of rice down as follows:

VN$14-16/100 kg. -- to carry to truck or boat
VN$ 8-10/100 kg. -- to place in boat or truck
VN$22-26/100 kg. -- total loading cost

In general, loading and unloading costs are lower in the Delta. They increase for the major shipping and receiving points the further north one goes.

Apparently, loading and unloading vegetables costs about the same as bagged and boxed goods. Livestock is somewhat cheaper. Cows and oxen may involve no charge since farmers or shippers, with the truck driver's help, drive them on or off the truck. Charges for loading and unloading hogs are about half that of bagged and boxed products, although at times the shipper may do it himself to avoid the cost. The charge for loading and unloading poultry is about one-fourth to one-half that for grain and feed. For example, the cost of loading (or unloading) a truck of cabbage or rice at Can Tho was estimated at VN$220/M.T. The same sources estimated the cost of loading chickens as varying between 56-112 VN$/M.T., depending on how they were prepared (whether in screened box) and where they were located for loading.

Trucks transporting goods from the Delta may incur ferry crossing charges and provincial taxes. Too, illegal privilege fees are sometimes incurred at checkpoints along the way. They are termed privilege fees here for lack of better designation and because they do provide the driver the privilege of continuing his transport. That privilege may be denied on one pretext or another for several hours if he should not

pay. These ferry charges, taxes, and fees are not included in the transportation rates discussed previously. Knowledgeable people estimate these costs between 10 and 20 percent of the transport rate.

Transport Costs and Wholesale Prices

Tables 15 through 18 show the relative importance of different transportation costs as a proportion of the wholesale price for goods moving from the Delta to the Saigon market.

Hauling fees comprise from about 60 to 75 percent of total transportation costs. Loading and unloading costs contribute only about 10 percent to total transportation costs for hogs, but as high as 25 percent for rice and vegetables.

The total transportation costs from Delta farming areas to Saigon under assumptions implied in the data of tables 15, 16, 17, and 18 contribute from 4 to 10 percent to the Saigon wholesale price of fruits and vegetables, a little over 6 percent to the wholesale price of rice, only 2.5 percent to the wholesale price of hogs, and 1.2 percent to the wholesale price of poultry.

Use of Rate Data and Potential Cost Improvements

One use of the rate data is illustrated in tables 15 through 18. Transportation cost is one component of the farm-to-retail margins used widely for planning and policymaking in market economies. It is measured as a portion of the wholesale price in tables 15-18, but can be gauged in other ways, depending on preference and use.

The main purpose for compiling rate data was to use it in developing transportation coefficients for a production and marketing model. Viewed in this context, transport rates are one aspect of the competition for land between alternative crops in an area. That competition depends on the difference between costs of production and the farm price the producer gets for the different crops. Transport costs affect the price the farmer gets. The price the consumer pays must be used to remunerate all those middlemen (including transportation) that handle the product, as well as the farmer who produces it.

In essence, most marketing problems with economic content involving marketing costs and supply must reckon with transportation as a component.

Table 19 contains transportation costs for particular products between selected points, computed from the general truck transport rate data and load factors.

Table 15.--Rice transportation costs from Delta to Saigon, Vietnam, 1972

Cost items	Costs	Proportion of total
	VN$/M.T.	Percent
Collection costs to Can Tho:		
Loading (in growing area)	200	5.1
Transport to Can Tho (90 km. x 9)	810	20.6
Overhead (20 percent of transport costs)	162	4.1
Unloading at Can Tho	250	6.3
Total collection costs	1,422	36.1
Movement to central market (Saigon):		
Loading at Can Tho	250	6.4
Transport to Saigon (169 km. x 9.7)	1,639.3	41.6
Overhead (20 percent of transport costs)	327.9	8.3
Unloading at Saigon	300	7.6
Total transport to central market	2,517.2	63.9
Grand total of transport costs	3,939.2	100.0

Transport cost	VN$3.9 per kilogram
Saigon wholesale price	VN$63.0 per kilogram
Transport cost as a proportion of wholesale price	6.2 percent

Table 16.--Market hog transportation costs from Delta to Saigon, Vietnam, 1972

Cost items	Costs	Proportion of total
	VN$/M.T.	Percent
Collection costs to Can Tho: 1/		
Transport to Can Tho (90 km. x 18)	1,620	25.9
Overhead (20 percent of transport costs)	324	5.2
Unloading	200	3.2
Total collection costs	2,144	34.3
Movement to central market (Saigon):		
Loading	200	3.2
Transport to Saigon (169 km. x 18)	3,042	48.7
Overhead (20 percent of transport costs)	608.4	9.8
Unloading	250	4.0
Total transport to central market	4,100.4	65.7
Grand total transport costs	6,244.4	100.0

Transport cost	VN$6.3 per kilogram
Saigon wholesale price	VN$250.0 per kilogram
Transport cost as a proportion of wholesale price	2.5 percent

1/ It was assumed there were no initial loading cost at farms for swine. Actually, it is questionable whether movement to Can Tho then to Saigon such as that assumed in the table is realistic.

Table 17.--Poultry transportation costs from Delta to Saigon, Vietnam, 1972

Cost items	Costs	Proportion of total
	VN$/M.T.	Percent
Collection costs to Can Tho:		
Loading at local departure	1/300	6.6
Transporting to Can Tho (90 km. x 11)	990	21.6
Overhead (20 percent of transport costs)	198	43.3
Unloading at Can Tho	150	3.3
Total collection costs	1,638	35.8
Transport to central market (Saigon)		
Loading at Can Tho	200	4.4
Transport to Saigon (169 km. x 12.5)	2,112.5	46.2
Overhead (20 percent of transport costs)	422.5	9.2
Unloading at Saigon	200	4.4
Total transport to central market	2,935	64.2
Grand total transportation costs	4,573	100.0
Transport cost	VN$4.6 per kilogram	
Saigon wholesale price	VN$400.0 per kilogram	
Transport cost as percentage of wholesale price	1.2 percent	

1/ The local departure point loading cost is doubled to account for (1) time involved in catching and putting the poultry in containers, (2) cost of containers, and (3) loading the containers of live poultry.

Table 18.--Fruit and vegetable transportation costs from Delta to Saigon, Vietnam, 1972

Cost items	Costs	Proportion of total
	VN$/M.T.	Percent
Collection costs to Can Tho:		
Loading at local point	250	5.5
Transport to Can Tho (90 km. x 11)	990	22.0
Overhead (20 percent of transport costs)	198	4.4
Unloading at Can Tho	250	5.5
Total collection costs	1,688	37.4
Transport to central market (Saigon)		
Loading at Can Tho	250	5.5
Transport to Saigon (169 km. x 11)	1,859	41.1
Overhead (20 percent of transport costs)	372	8.2
Unloading at Saigon	350	7.8
Total transport to central market	2,831	62.6
Grand total transportation costs	4,519	100.0
Transport cost	VN$4.5 per kilogram	
Saigon wholesale price 1/	VN$50-100 per kilogram	
Transport cost as a proportion of wholesale price	4.5 - 9 percent	

1/ Prices, of course, of the different vegetables vary. Cabbage was about VN$70/kg.; lettuce, VN$50-60/kg.; watermelon, VN$100/kg., at the time of study.

Adjustments for road conditions may be made by increasing the rate by approximately 40 percent and 100 percent for gravel and earth roadbeds respectively. The proportion these roads are to total road distance involved should be taken into account. Adjustments for internal water transport may be made by applying approximately 67 percent of the truck rate. Peacetime conditions likely will lower this to 50 percent. Coastal shipping would be somewhat lower if considerable distance is involved. Factors other than volume and weight affect rates charged, and are reflected in costs estimated in table 19. Oil draws a higher rate because it is a high value product and may be messy to handle if broken or spilled. Some bulky products (brans, feathers, etc.) were given more space leniency than other products in computing loads because they are more likely to be piled higher, will compress somewhat, and because their ease in loading and unloading encourages somewhat lower rates per truck.

Data from table 19, adjusted as needed, may be used in such undertakings as planning crop production, market cost comparisons, as guides in setting public transport rates, and in transportation efficiency evaluation. They are acknowledged to be rough reflections of real rates. Rates vary widely, partly as a consequence of the unsettled conditions of the country and partly due to a lack of needed organization and information in marketing. They are as representative of real rates as one may get at this writing. Until more precise (and less varied) data are generated in practice, those given here can serve as an effective research and policy planning tool.

There are a number of conditions that contribute to higher costs (consequently higher transport rates) than would otherwise prevail. Previous studies have suggested that road repair and maintenance savings alone would compensate for the higher initial cost of a durable roadbed capable of withstanding the punishment of heavily loaded trucks. Savings in road repair and maintenance may not be as large as savings in truck repair, maintenance, and depreciation from the better roads. However, both should be reckoned with in planning future highways. The latter, particularly, should result in lower cost of transport.

Refrigerated transportation is more costly than non-refrigerated, possibly twice as high. As indicated in a previous section, however, transport loss of vegetables and fruits is great, and wastes a critical (food) component of national consumption. Savings potential from using refrigeration, once peace is established, likely could be measured in VN$ billions annually. Savings likely would compensate for higher cost of refrigerated transport, refrigerated wholesale storage, and refrigerated retailing. Certainly, the potential justifies an economic evaluation of the likely cost-benefits of integrated refrigeration facilities to handle perishable products from the farm through the retailer.

Variation in truck transport rates charged is in part a consequence of variation in services. Such variation is not necessarily undesirable. However, rates also vary because those who bargain do not have sufficient knowledge of going rates. There may be some justification for such transportation

Table 19.--Estimated truck transport costs for shipping specified products between selected regional points, Vietnam

Item and product	Load	Can Tho to Saigon	Saigon to Phan Rang	Qui Nhon to Da Nang	Phan Rang to Ban Me Thout	Can Tho to Ban Me Thout	Can Tho to Qui Nhon	Can Tho to Da Nang
	M.T.				VN$/M.T.			
Distance - kms. ..	--	169	348	300	280	522	846	1,139
Soybean oil 1/ ...	10	2,028	3,821	3,366	3,192	5,638	9,137	12,301
Peanuts 2/	6.2	2,726	5,136	4,524	4,291	7,578	12,281	16,535
Soybean meal 3/ ..	7.9	2,140	4,031	3,551	3,368	5,948	9,639	12,978
Wheat bran 4/	5.0	3,380	6,368	5,610	5,320	9,396	15,228	20,502
Rice 5/	10	1,690	3,184	2,805	2,660	4,698	7,614	10,251
Chickens and ducks	6.5	2,603	4,903	4,320	4,096	7,235	11,726	15,787
Market hogs 6/ ...	5.0	3,380	6,368	5,610	5,320	9,396	15,228	20,502
Cotton	6.7	2,518	4,744	4,179	3,963	7,000	11,345	15,274
Pineapple	8.8	1,927	3,630	3,198	3,032	5,356	8,680	11,686
Banana	7.6	2,224	4,190	3,691	3,500	6,183	10,020	13,490
Coconut	7.0	2,417	4,553	4,011	3,804	6,718	10,888	14,659
Copra	8.0	2,112	3,980	3,506	3,325	5,872	9,518	12,814
Tobacco	6.0	2,817	5,307	4,675	4,433	7,830	12,690	17,085
Tea	7.5	2,253	4,245	3,740	3,547	6,264	10,152	13,668
Duck feathers	4.0	4,225	7,960	7,012	6,650	11,745	19,035	25,628

1/ Same for peanut oil, cottonseed oil, and coconut oil. Rate 20 percent above standard.

2/ Same for rice bran.

3/ Same for cottonseed meal.

4/ Same for peanut meal, kenaf, and jute.

5/ Same for corn, sorghum, wheat, sugar, soybeans, coffee, and fertilizer.

6/ Same for beef animals.

rate setting in a nation at war. Once peace is established, steps should be taken to get greater uniformity in, and more widespread knowledge of, transportation rates.

This will not be accomplished to a desirable extent until another aspect of orderly marketing, contract pricing (that is, buyer contracts to buy at a set price for future delivery) is widely practiced. The seller who has an assured price on the other end is not as pressured to cutting the time margin between acquisition and disposal of the product he handles. There is no doubt that fear of an unfavorable price change while the product is enroute currently pressures many wholesalers, particularly those with smaller operations, into paying higher transport rates in an effort to lessen the delay in delivery. Sudden price changes may be less likely to occur in peacetime than now, but they still will be a characteristic of the free market.

The various orderly processes by which risk is lessened, transferred, or eliminated that characterize a mature market economy should be given serious consideration in planning for the future Vietnamese market economy. A transportation regulatory agency of the Vietnamese Government appears to be one of the necessary prerequisites to orderly transport and marketing, even though it may not be a sufficient condition by itself.

APPENDIX

One can be easily confused about truck sizes used in transportation in Vietnam. Trucks are classed by tonnage. One called a 10-M.T. in some localities may be only a 7-M.T. in others. A general practice of overloading contributes to the confusion.

However, the often-quoted 10-M.T. truck and 7-M.T. truck apparently are common conveyances used in the transport of agricultural products. Field information revealed that 10 M.T. of rice comprised a load on the larger truck. Estimates of their length centered around 14 feet, with 12 and 16 feet mentioned. Truck beds are universally 8 feet wide. How many cubic feet of space would be required to carry 10 M.T. of bagged rice?

Rough rice averages 45 pound per bushel (1.244456 cubic feet space), and there are 490 bushels in 10 M.T. Consequently, 10 M.T. of bulk rice occupies about 610 cubic feet of space. If bagged and stacked, it no doubt would require more space than that, possibly 10-20 percent more, or 670-730 cubic feet of space. Following are indications of space for various truck bed lengths and heights:

Width	Length	Height	Total Cubic Feet Space
8	12	7	672
8	12	8	768
8	14	6	672
8	14	7	784
8	16	6	768
8	16	7	896

Consequently, a truck with a 14-foot bed stacked 6 or 7 feet high could carry 10 M.T. of bagged rice.

Assuming the 10-M.T. truck has around 672 cubic feet of space, one can estimate the size load of most produce it will carry if he knows the ratio of weight to volume of that produce. Appendix table 1 shows load estimates for various products, based on these assumptions.

Appendix Table 1.--Estimated weights of Vietnamese agricultural products that may be transported on 10-M.T. truck

Product	Pounds per cubic foot	M.T. per 670 cubic feet	10-M.T. truck load
	Pounds	M.T.	
Rice	34	10.4	10.0
Corn	45	13.7	10.0
Sorghum grain	45	13.7	10.0
Wheat	48	14.6	10.0
Rice bran	20 - 21	6.2	6.2
Cottonseed meal	25 - 27	7.9	7.9
Wheat bran	11 - 16	4.9	5.0
Soybean meal	25 - 27	7.9	7.9
Flour	1/	1/	10.0
Cottonseed oil	55	16.8	10.0
Coconut oil	55	16.8	10.0
Sugar	2/	2/	10.0
Peanuts (in shell)	14 - 24	4.3 - 6.1	6.2
Peanut meal	15	4.6	5.0
Soybeans	48	14.6	10.0
Pork	3/	3/	5.0
Chickens	4/	4/	6.5
Chicken eggs 5/	14	4.5	4.5
Beef	6/	6/	5.0
Cotton	7/22	6.7	6.7
Pineapple	8/29	8.8	8.8
Pineapple juice	55	16.8	10.0
Bananas	25	7.6	7.6
Coffee			10.0
Kenaf	9/15	4.6	5.0
Jute	9/15	4.6	5.0
Coconut	23	7.0	7.0
Copra	26	8.0	8.0
Tea	24.6	7.5	7.5
Tobacco	19.7	6.0	6.0
Duck feathers	13.0		4.0
Soybean oil	55	16.8	10.0
Cabbage	19 - 27	5.8 - 8.2	
Melons (honey dew)	28	8.5	

1/ Ground wheat is 38-39 lbs./cu. ft. or 11.7 M.T./truck. Flour should be heavier.

2/ Density weight was not obtained since there was no reason to question 10-M.T. could be carried.

3/ 50-60 hogs weighing 80-120 kgs. each are loaded on a 10-M.T. truck.

- Continued

Appendix Table 1.--Estimated weights of Vietnamese agricultural products that may be transported on 10-M.T. truck - Cont'd.

4/ Around 3,000 to 3,500 head weighing 1.5 to 2.0 kgs. each.

5/ One case of chicken eggs (30 dozen) weighing 47 pounds in a case of approximately 3.2 cubic feet space. However, egg transport rate is higher per 10-M.T. truck than for regular commodities.

6/ Assumed the same as hogs.

7/ Standard density.

8/ 70-pound crates of 2.4 cubic foot space were used as guide.

9/ Standard Pucca bale compressed for export is 37 lbs./cu. ft. Kutcha bale, said to be less than half of this, was estimated at 15 lbs./cu. ft.

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